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CORRECTIVE MEASURES STUDY FOR SOLID WASTE MANAGEMENT UNITS 12 AND 17
NS MAYPORT FL
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TETRA TECH NUS

Corrective Measures Study for Solid Waste Management Units 12 and 17

Naval Station Mayport
Mayport, Florida

Southern Division
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0118

March 2003

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CORRECTIVE MEASURES STUDY FOR SOLID WASTE MANAGEMENT UNITS 12 & 17

NAVAL STATION MAYPORT
MAYPORT, FLORIDA

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
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Naval Facilities Engineering Command
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PROFESSIONAL ENGINEER CERTIFICATION

This document, *Corrective Measures Study for Solid Waste Management Unit Numbers 12 and 17, Naval Station Mayport, Mayport, Florida*, has been prepared under the direction of a Florida Registered Professional Engineer. The work and professional opinions rendered in this report were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice. This document was prepared for Naval Station Mayport, Mayport, Florida, and should not be construed to apply to any other site.

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FOREWORD

To meet its mission objectives, the U.S. Navy performs a variety of operations, some requiring the use, handling, storage, or disposal of hazardous materials. Through accidental spills and leaks and conventional methods of past disposal, hazardous materials may have entered the environment in ways unacceptable by today's standards. With growing knowledge of the long-term effects of hazardous materials on the environment, the Department of Defense initiated various programs to investigate and remediate conditions related to suspect past releases of hazardous materials at their facilities.

One of these programs is the Installation Restoration (IR) program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act. The acts, passed by Congress in 1980 and 1986, respectively, established the means to assess and clean up hazardous waste sites for both private-sector and Federal facilities. These acts are the basis for what is commonly known as the Superfund program.

Originally, the Navy's part of this program was called the Navy Assessment and Control of Installation Pollutants (NACIP) program. Early reports reflect the NACIP process and terminology. The Navy eventually adapted the program structure and terminology of the standard IR program.

The IR program is conducted in several stages as follows.

- The preliminary assessment (PA) identifies potential sites through record searches and interviews.
- A site inspection (SI) then confirms which areas contain contamination, constituting actual "sites." (Together, the PA and SI steps were called the Initial Assessment Study under the NACIP program.)
- Next, the remedial investigation and the feasibility study (RI/FS) together determine the type and extent of contamination, establish criteria for cleanup, and identify and evaluate any necessary remedial action alternatives and their costs. As part of the RI/FS, a risk assessment identifies potential effects on human health or the environment to help evaluate remedial action alternatives.
- The selected alternative is planned and conducted in the remedial design and remedial action stages. Monitoring then ensures the effectiveness of the effort.

A second program to address present hazardous material management is the Resource Conservation and Recovery Act (RCRA) Corrective Action Program. This program is designed to identify and clean up releases of hazardous substances at RCRA-permitted facilities. RCRA ensures that solid and hazardous wastes are managed in an environmentally sound manner. The law applies primarily to facilities that generate or handle hazardous waste.

The RCRA program is conducted in the following three stages.

- The RCRA facility assessment identifies solid waste management units, evaluates the potential for releases of contaminants, and determines the need for future investigations.

- The RCRA facility investigation then determines the nature, extent, and fate of contaminant releases.

- The corrective measures study identifies and recommends measures to correct the release

The hazardous waste investigations at Naval Station (NAVSTA) Mayport are presently being conducted under the RCRA Corrective Action Program. Earlier preliminary investigations had been conducted at NAVSTA Mayport under the Navy's NACIP program and IR program following Superfund guidelines. In 1988, in coordination with the U.S. Environmental Protection Agency (USEPA) and the Florida Department of Environmental Regulation, now known as the Florida Department of Environmental Protection (FDEP), the hazardous waste investigations were formalized under the RCRA program.

Mayport is conducting the cleanup at their facility by working through the Southern Division, Naval Facilities Engineering Command. The USEPA and the FDEP oversee the Navy environmental program. All aspects of the program are conducted in compliance with state and federal regulations, as ensured by the participation of these regulatory agencies.

Questions regarding the RCRA program at NAVSTA Mayport should be addressed to Cheryl Mitchell (Code N4E) (904) 270-6730.

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ACRONYMS

ABB-ES	ABB Environmental Services, Inc.
AOC	area of concern
ARAR	applicable or relevant and appropriate requirement
BEHP	bis(2-ethylhexyl)phthalate
bgs	below ground surface
CAMP	Corrective Action Management Plan
CAO	Corrective Action Objective
CCED	Clean Closure Equivalency Demonstration
CFB	Carbonaceous Fuel Boiler
CFR	Code of Federal Regulations
CMS	Corrective Measures Study
COC	contaminant of concern
COI	contaminant of interest
COPC	contaminant of potential concern
COPC-E	ecological contaminant of potential concern
CTL	cleanup target level
ELCR	excess lifetime cancer risk
EP	extraction procedure
ERA	ecological risk assessment
F.A.C.	*Florida Administrative Code*
FDEP	Florida Department of Environmental Protection
GCTL	groundwater cleanup target level
GIR	General Information Report
gpm	gallons per minute
HHRA	Human Health Risk Assessment
HI	Hazard Index
HLA	Harding Lawson Associates
HQ	Hazard Quotient
HSWA	Hazardous and Solid Waste Amendments
IM	interim measure
ISV	in situ vitrification
LDR	land disposal restriction
LUC	land use control
LUCIP	Land Use Control Implementation Plan
MCL	Maximum Contaminant Level
MCS	Media Cleanup Standards
Meq	milliequivalents
mg/kg	milligrams per kilogram
MNA	monitored natural attenuation
MOA	Memorandum of Agreement

NAVSTA	U.S. Naval Station
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
POTW	Publicly Owned Treatment Works
PRE	personal protective equipment
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SCTL	soil cleanup target level
SU	standard unit
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TOC	Total Organic Carbon
TSDF	treatment, storage, and disposal facility
UCL	upper confidence level
USCS	Unified Soil Classification System
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
UV	ultraviolet
VOC	volatile organic compound
VSI	visual site inspection

EXECUTIVE SUMMARY

A Corrective Measures Study (CMS) has been conducted for Solid Waste Management Units (SWMUs) 12 and 17 at Naval Station (NAVSTA) Mayport in Mayport, Florida, by the Southern Division, Naval Facilities Engineering Command, pursuant to the Resource Conservation and Recovery Act (RCRA). This CMS was conducted in accordance with the Hazardous and Solid Waste Amendments (HSWA) permit FL9 170 024 260, issued by the U.S. Environmental Protection Agency (USEPA) on March 25, 1988, and revised and reissued on June 15, 1993. The HSWA/RCRA program is designed to identify and clean up releases of hazardous substances at RCRA-permitted facilities. RCRA ensures that solid and hazardous wastes are managed in an environmentally sound manner. The law applies primarily to facilities that generate or handle hazardous waste.

The RCRA program is conducted in the following three stages.

1. The RCRA Facility Assessment (RFA) identifies SWMUs, evaluates the potential for releases of contaminants, and determines the need for future investigations.

2. The RCRA Facility Investigation (RFI) then determines the nature, extent, and fate of contaminant releases.

3. The CMS identifies and recommends measures to correct the releases.

The RFA report for SWMUs 12 and 17 was issued in April 1988. The RFI report was issued in January 1996 for SWMU 12 and in December 1996 for SWMU 17. This report presents the results of the CMS, including the:

1. Determination of the Media Cleanup Standards (MCSs) using the recently approved regulation Chapter 62-777, *Florida Administrative Code* (F.A.C.).
2. Selection of Contaminants of Concern (COCs).
3. Determination of areas and volumes of impacted media exceeding the MCSs.
4. Development, screening, and evaluation of corrective measure alternatives.
5. Recommendation of corrective action to address contaminated media at SWMUs 12 and 17.

This CMS report contains the results of the identification, screening, and evaluation of corrective measure alternatives for all media at SWMU 12, Neutralization Basin; and SWMU 17, Carbonaceous Fuel Boiler Area.

SWMU 12, Neutralization Basin

SWMU 12, the Neutralization Basin, is located in the northern part of NAVSTA Mayport along the shoreline of the St. Johns River. The Neutralization Basin at SWMU 12 is located approximately 40 feet north of Boiler Building 1241 and 75 feet south of the river.

The construction of the original Neutralization Basin at the current site was completed in 1971. This basin had an asphalt base covered with a synthetic liner. The original basin was damaged by a storm in 1985. Because of the damage, in 1986 the original basin material was removed and a new Neutralization Basin was constructed on the same site.

In 1992, a release of sodium hydroxide occurred when the Neutralization Basin's sodium hydroxide tank was being removed from service. The tank was not completely emptied before removal due to a faulty pump; the accidental release resulted in a spill of approximately 300 gallons of sodium hydroxide on the ground. The release occurred about 20 feet east of the southeastern corner of the Neutralization Basin and 40 feet north of the boiler plant (Building 1241). Subsequently, stressed vegetation was observed in the vicinity of the spill. A 6- to 9-inch-thick layer of soil was placed over the release area, and the soil was seeded.

The only COC in soil for a hypothetical resident at SWMU 12 is arsenic. The future use of the SWMU is to remain industrial and, therefore, a resident is considered unlikely. No COCs were identified for industrial use at SWMU 12 for surface soil or groundwater based on the available data. Therefore, the volume of contaminated soil and the volume of contaminated groundwater were not calculated.

Although there were no industrial use COCs for soil, arsenic did exceed the residential standards. Therefore, two alternatives were developed to ensure that SWMU 12 future use remains industrial. The alternatives are as follows:

Soil Alternative 1: No Action
Soil Alternative 2: Land Use Controls (LUCs) and Site Monitoring

The preferred corrective measure alternative for soil at SWMU 12 is Alternative 2, which involves implementing LUCs at the site. The current levels of contaminant concentrations were within the acceptable levels defined by the Florida Department of Environmental Protection (FDEP). Because the screening levels used for the assessment of soil conditions are based on an industrial scenario, LUCs should be implemented. Monitoring of LUCs will ensure that LUCs are implemented to make the site available for industrial purposes only. Alternative 2 will provide the required protection by implementing LUCs at the site. In the absence of COCs, LUCs would provide adequate and cost-effective protection of human health and the environment.

Because there were no COCs for groundwater at SWMU 12, no corrective action is required.

SWMU 17, Carbonaceous Fuel Boiler Area

SWMU 17, the Carbonaceous Fuel Boiler (CFB), is located in the north-central part of NAVSTA Mayport. The CFB is located southwest of the Mayport Turning Basin, approximately 350 feet west of Echo Pier. The CFB was a furnace fuelled by domestic solid waste from both the NAVSTA Mayport fleet and the housing area within the station. The CFB also burned waste oil collected from various locations within the station as well as oil recovered from bilge water by the oily waste treatment plant. Waste oil and diesel fuel were stored at the CFB in two 6,000-gallon underground storage tanks (USTs) and two 550-gallon USTs, respectively. The CFB was operated 24 hours a day from 1979 to mid-1994, at which time it was taken out of service.

Boiler blowdown, tipping floor runoff, and quench water from the CFB were discharged into the sanitary sewer system. The boiler's air emission control system included a continuous blowdown for quenching ash and a fly-ash collector. Quenched ash (wet ash or bottom ash) was removed from the bottom of the furnace and placed in dumpsters. Fly ash (dry ash) was collected by a multi-cyclone separator and disposed of along with the quenched ash.

The RFA report identified the CFB as a SWMU because fly ash was being stored on the north side of the CFB building and a small amount of ash was noted to be piled on the asphalt near a roll-off container. Quenched ash, when tested, did not exceed the Federal regulatory criteria for hazardous waste using the extraction procedure (EP) toxicity test. However, the fly ash exceeded the Federal regulatory criteria for lead and cadmium using the EP toxicity test.

The COCs in soil for a hypothetical resident include arsenic, benzo(a)anthrancene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, 4,4'-DDE, and dieldrin in surface soil. The future use of the SWMU is to remain industrial and, therefore, a resident is considered unlikely. The soil COCs for industrial use at SWMU 17 include benzo(a)pyrene and dieldrin in surface soil. The COCs in groundwater at SWMU 17 include iron, ammonia, and manganese. For SWMU 17, there are two separate areas of soil contamination, which consist of both organic contamination and inorganic contamination in each. The areal extent of surface soil contamination was estimated to be 15,700 ft^2 with a volume estimate of 1,165 yd^3.

For SWMU 17 groundwater, the smaller area of inorganic contamination is within the larger area of inorganic contamination. The estimated volume of groundwater contamination is approximately 9,700,000 gallons of inorganic (iron and manganese) -contaminated groundwater and 1,900,000 gallons of ammonia-contaminated groundwater. Estimated areas of groundwater contamination for inorganics and ammonia are approximately 87,800 ft^2 and 17,400 ft^2, respectively.

Four soil alternatives were developed to address soil contamination at SWMU 17. The alternatives are as follows:

Soil Alternative 1:	No Action
Soil Alternative 2:	LUCs and Site Monitoring
Soil Alternative 3:	Capping, LUCs, and Site Monitoring
Soil Alternative 4:	Surface Soil Excavation, Offsite Disposal, and LUCs

The recommended corrective measure alternative for the SWMU 17 soil is Alternative 3. This alternative will implement LUCs at the site and monitoring for groundwater quality for the presence of potential contaminants (i.e., COCs in soil that could leach to groundwater). In addition, this alternative would provide protection by constructing an asphalt cover over the uncovered contaminated soil areas. The asphalt cover (approximately 6,500 ft^2 required east of Building 1430 and 1,500 ft^2 required west of Building 1430) would act as a water-resisting and impermeable layer providing protection against potential infiltration. Although no surface soil COCs are currently a concern in groundwater, providing the asphalt cover in the uncovered contaminated areas would provide adequate and cost-effective protection of human health and the environment.

Three alternatives were developed to address groundwater contamination at SWMU 17. The alternatives are as follows:

Groundwater Alternative 1:	No Action
Groundwater Alternative 2:	Monitored Natural Attenuation (MNA), LUCs, and Site Monitoring
Groundwater Alternative 3:	Groundwater Extraction, Ex Situ Treatment, Surface Discharge, LUCs, and Site Monitoring

The preferred corrective measure alternative for groundwater at SWMU 17 is Alternative 2, which involves LUCs and monitoring to address limited groundwater contamination at the site. Any elaborate treatment system would not be justified because the Surficial Aquifer is not currently used as a potable water source and there is no risk to the ecological receptors. Furthermore, the contaminants in the groundwater at SWMU 17 are not expected to affect the surface water at the Mayport Turning Basin because the basin is approximately 300 feet downgradient of SWMU 17 and the groundwater velocity is low (13 feet/year). In addition, according to the RFI, two layers of retaining walls constructed along the perimeter of the Mayport Turning Basin prevent or limit the direct interaction between groundwater and surface water. Once the source of contamination is addressed, the volume and extent of contamination in groundwater to be addressed would be limited. Alternative 2 relies on natural processes whose progress would be monitored by periodic sampling. Because of the low level of contamination, Alternative 2 offers a cost-effective corrective action that would meet acceptable concentrations in about 8 years.

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1.0 INTRODUCTION

A Corrective Measures Study (CMS) has been conducted for Solid Waste Management Units (SWMUs) 12 and 17 at Naval Station (NAVSTA) Mayport in Mayport, Florida, by the Southern Division, Naval Facilities Engineering Command, pursuant to the Resource Conservation and Recovery Act (RCRA). Tetra Tech NUS has been contracted by the Department of the Navy, Southern Division, Naval Facilities Engineering Command, to complete a CMS under contract number N62467-94-D-0888. This report presents the results of the CMS, including the:

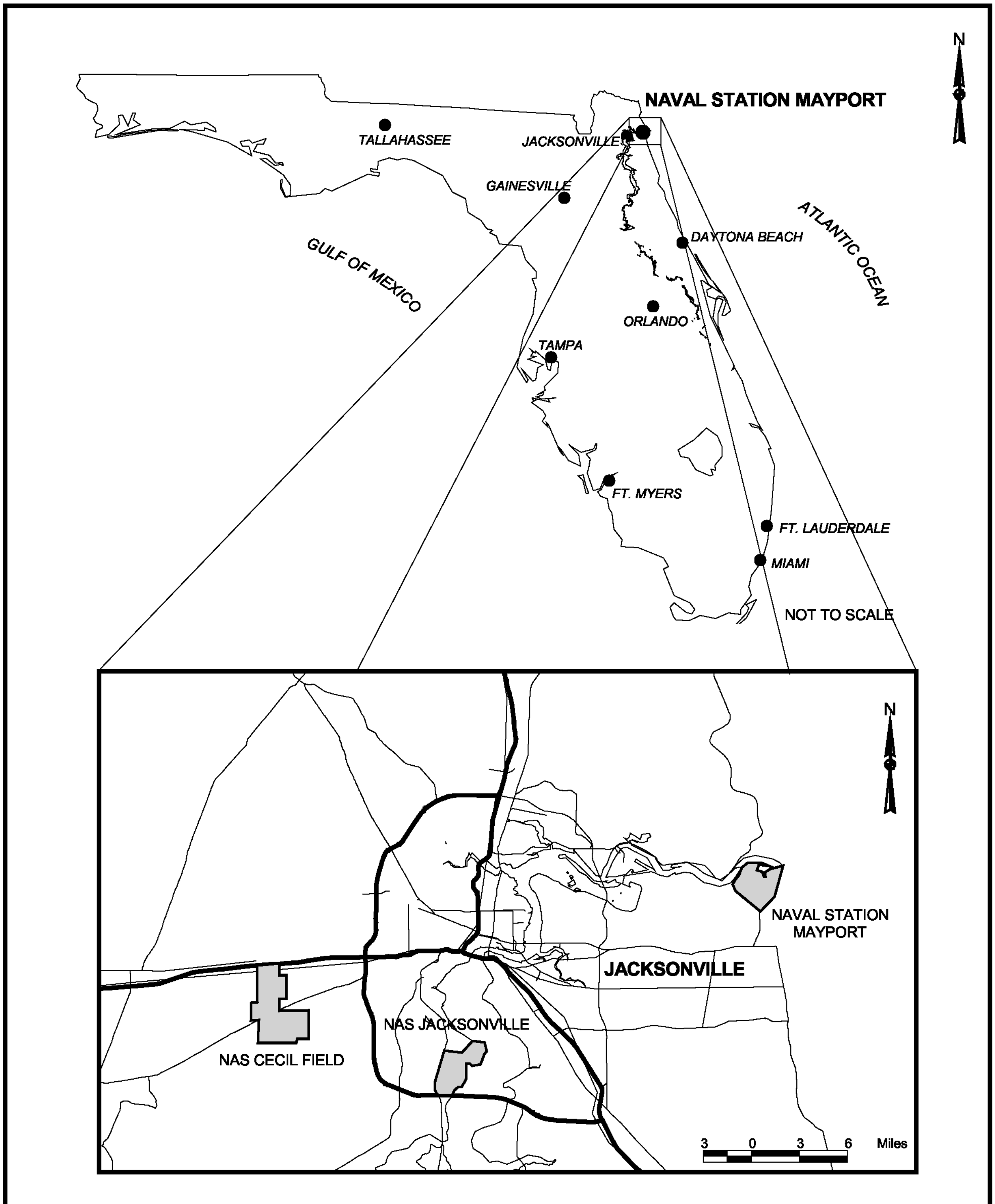
1. Determination of the Media Cleanup Standards (MCSs) using the recently approved regulation Chapter 62-777, *Florida Administrative Code* (F.A.C.).
2. Selection of Contaminants of Concern (COCs).
3. Determination of areas and volumes of impacted media exceeding the MCSs.
4. Development, screening, and evaluation of corrective measure alternatives.
5. Recommendation of corrective action to address contaminated media at SWMUs 12 and 17.

1.1 FACILITY DESCRIPTION

NAVSTA Mayport is located near the town of Mayport within the city limits of Jacksonville, Florida, in northeastern Duval County on the south shore of the confluence of the St. Johns River and the Atlantic Ocean (Figure 1-1).

A RCRA Facility Assessment/visual site inspection (RFA/VSI) for NAVSTA Mayport was conducted for the U.S. Environmental Protection Agency (USEPA) Region IV in 1989 (Kearny, 1989). The RFA/VSI identified 56 SWMUs and 2 Areas of Concern (AOCs) at NAVSTA Mayport. These SWMUs and AOCs were included in the Hazardous and Solid Waste Amendments (HSWA) permit. Fifteen of these SWMUs were determined to require no further action. Twenty-three of the remaining SWMUs and the two AOCs were determined to require further investigation by conducting RFA/sampling visits, referred to in the current HSWA permit as confirmatory sampling. The remaining 18 SWMUs, including SWMU 12 and 17, were determined to require a RCRA Facility Investigation (RFI).

Because of the number of SWMUs, the diversity of their past and present operations, and the magnitude of the permit requirements, the USEPA recommended that a phased approach be used to implement the RFI and other corrective action activities at NAVSTA Mayport. A Corrective Action Management Plan



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COST/SCHEDULE-AREA			NAVAL STATION MAYPORT	APPROVED BY — DATE —
SCALE AS NOTED			MAYPORT, FLORIDA	DRAWING NO. FIGURE 1-1 REV 0

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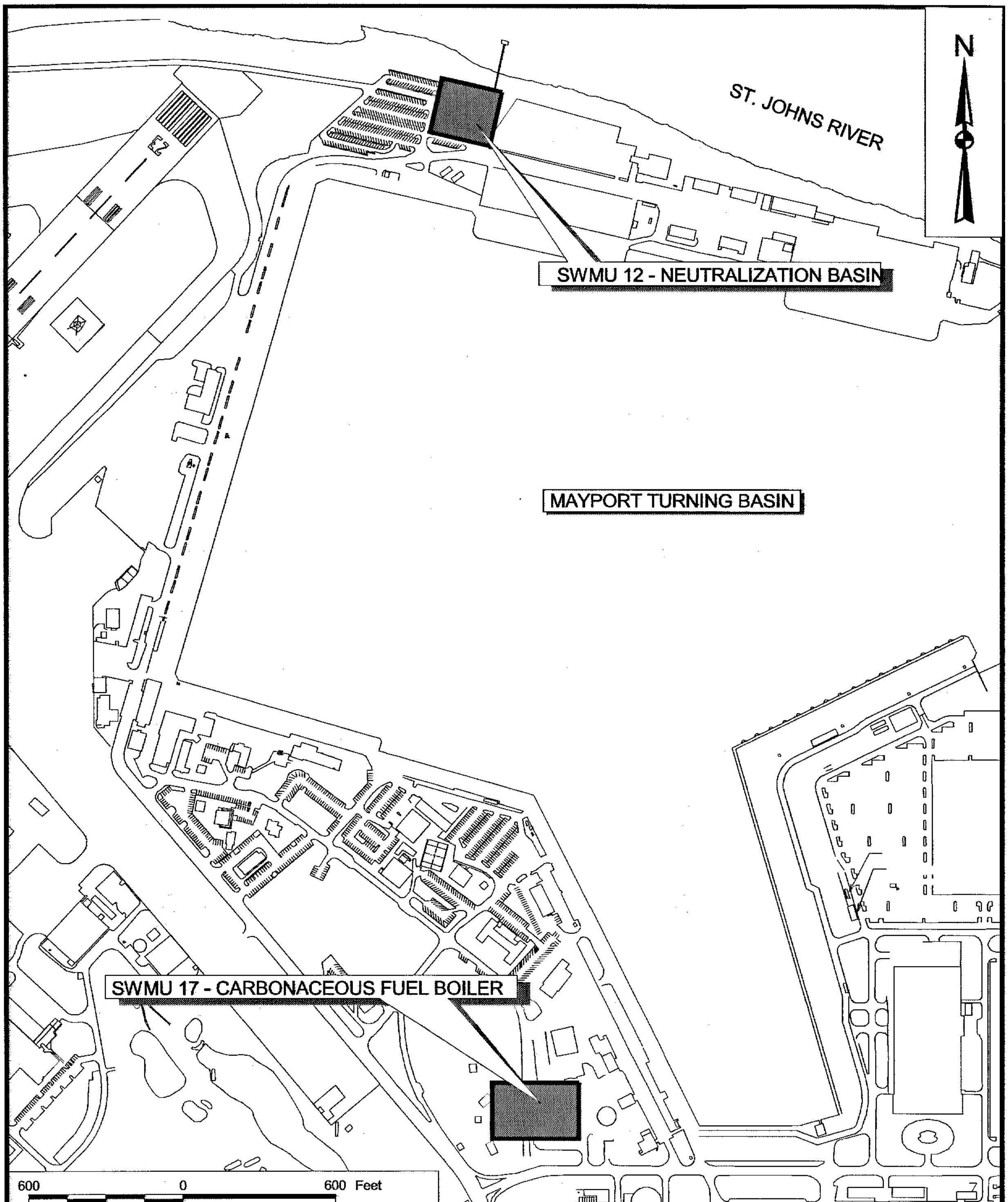
(CAMP) was prepared in response to the USEPA recommendation and describes the strategy used to implement the RCRA corrective action program at NAVSTA Mayport (ABB-ES, 1995a).

The corrective action program at NAVSTA Mayport described in the CAMP invoked a phased approach to assure collection of adequate site characterization data to support the selection of effective corrective measures. The structure of the corrective action program at NAVSTA Mayport is based on the establishment of four SWMU groups: Groups I, II, III, and IV. The corrective action activities at each SWMU group are being implemented in phases.

This CMS report is for SWMUs 12 and 17 at NAVSTA Mayport. SWMU 12 is located in the Group II area and SWMU 17 is located in the Group III area (Figure 1-2). SWMU 12 is located in the northern part of NAVSTA Mayport along the shoreline of the St. Johns River; SWMU 17 is located along the southern perimeter of the Mayport Turning Basin. Activities that have occurred at the sites since completion of the RFI are summarized below.

Land Use Controls (LUCs) have been approved as an additional Interim Measure (IM) and implemented at both SWMUs which restrict current and future land use to other than residential. Both SWMUs 12 and 17 were formerly part of the infrastructure to support NAVSTA Mayport: SWMU 12 consists of the neutralization basin formerly used in the treatment process for the boiler plant effluent, and SWMU 17 is the carbonaceous fuel boiler that formerly burned wastes generated at the station to produce steam. Potentially hazardous substances were part of the waste stream at both sites, but neither waste disposal nor long-term storage of wastes (i.e., greater than 90 days) was conducted at either SWMU.

The RFI reports for Group II and Group III SWMUs (ABB-ES, 1996a and 1996b, respectively) contain pertinent information about the site background, environmental setting, nature and extent of contamination, the identification of RFI contaminants of potential concern (COPCs), seasonal or updated concentrations of contaminants in environmental media, and the results of remedial measures that have reduced or eliminated risks or exposure pathways between certain media and potential receptors for SWMUs 12 and 17. In addition, a RCRA Clean Closure Equivalency Demonstration (CCED) Petition (HLA, 1998) completed for the neutralization basin at SWMU 12 contains more recent investigation data. Information has been taken from these reports to describe the current conditions of each SWMU presented in Sections 2 and 3 of this CMS. The results of additional investigation and sampling activities (i.e., field and analytical data) conducted since the completion of the RFI have been incorporated into this CMS to refine the Corrective Action Objectives (CAOs). In addition, the CMS analytical database, upon which certain decisions and recommendations have been made, has been updated with the post-RFI data, where applicable.



DRAWN BY J. BELLONE / DATE 1/129/01	Tetra Tech NUS, Inc.	CONTRACT NUMBER N0455	OWNER NO. —
CHECKED BY — / DATE —	SWMU 12 & 17 LOCATION MAP NAVAL STATION MAYPORT MAYPORT, FLORIDA	APPROVED BY — / DATE —	
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SCALE AS NOTED		DRAWING NO. FIGURE 1-2	REV 0

P:\GIS\MAYPORT\SWMU12-17_CMS3.APR\FIG 1-2_SWMU 12-17 LOCATION MAP JCB 3/27/01

1.2 ORGANIZATION OF THIS REPORT

This CMS report consists of three sections that describe SWMUs 12 and 17, summarize the RFI findings pertinent to conducting the CMS, identify the contaminants and media that present unacceptable risk to human and ecological receptors, and evaluate and recommend a preferred alternative for addressing those risks. Section 1.0 includes a general facility description, identifies the primary sources of information, describes the physical and environmental setting of the SWMUs of interest, and presents the general methodology used in the CMS to identify contaminants and media of concern. Sections 2.0 and 3.0 describe the current conditions for each SWMU, present the evaluation and selection of COPCs and COCs, identify and evaluate remedial alternatives, and select the preferred alternative for all media of concern at each SWMU. Appendix A contains the CMS data set for SWMUs 12 and 17. Appendix B contains the representative concentration calculations. Appendix C contains the calculations for areas and volumes of contaminated media. Appendix D contains the cost estimates for the corrective measures alternatives. Appendix E contains the design calculations for the alternatives. Appendix F contains supporting information. Appendix G contains the USEPA and Florida Department of Environmental Protection (FDEP) comments on the draft CMS and the response to the comments.

1.3 PHYSICAL CHARACTERISTICS OF SWMUs 12 AND 17

A detailed description of the physical characteristics of NAVSTA Mayport, including topography, demography, climate, soil types, and regional hydrogeology has been presented in Sections 1.0 and 3.0 of the NAVSTA Mayport General Information Report (GIR) (ABB-ES, 1995b). The following sections also provide summaries of the geologic and hydrologic data collected at the Group II and Group III SWMUs, specifically for SWMUs 12 and 17, that were presented in the Group II and Group III RFI reports (ABB-ES, 1996a and 1996b, respectively).

1.3.1 <u>Geology</u>

In the Group II and Group III areas where SWMUs 12 and 17 are located, dredge material overlies undifferentiated post-Hawthorn deposits to depths of approximately 8 to 16 feet below ground surface (bgs). The thickness of the dredge material is a result of variations in the original topographic contour of the near-shore environments in which the dredge material was placed. The dredge material consists predominantly of fine-grained, well-sorted sands that may include marine shell fragments. Underlying the dredge materials are sediments that comprise the undifferentiated post-Hawthorn deposits. These sediments primarily consist of fairly uniform, well-sorted, fine-grained sand with a Unified

Soil Classification System (USCS) designation of SP. However, the undifferentiated deposits (CH or MH visual classification) frequently include a very soft gray to dark gray silt clay layer that is 3 to 7 feet thick that likely represents recent estuarine deposition. This layer appears to be restricted to more landward, lower-energy depositional zones and is not found in former high-energy beach or river channel deposits. The undifferentiated post-Hawthorn deposits are likely the product of Miocene to Holocene fluvial and marine deposition and the erosion and redeposition of Hawthorn Group sediments. The top of the Upper Hawthorn deposits was estimated to be at a depth of approximately 70 to 72 feet bgs in the Group III area. Lithologically, the Hawthorn Group is quite variable and consists of calcareous, phosphatic sandy clays and clayey sands interbedded with thin discontinuous lenses of phosphatic sand, sandy limestone, limestone, and dolostone. The contact between the Hawthorn and the overlying, undifferentiated Miocene and younger deposits is marked by an unconformity expressed by a coarse phosphatic sand and a gravel bed.

Shallow soil in the SWMU 12 area typically consists of relatively uniform, tan to gray, fine-grained sand with shell fragments. Minor seams of concentrated shell material were present in some of the borings.

Shallow soil in the SWMU 17 area consists of relatively uniform, light-tan to tan, brown to dark-brown, or gray, very fine to fine-grained sand and silty sand with shell fragments that may make up to approximately 20 percent of the soil sample. These sands are primarily dredge material with a minor amount of engineered fill material deposited over the last 55 years.

1.3.2 Hydrogeology

Three primary aquifer systems are recognized beneath NAVSTA Mayport (in descending order): the Surficial Aquifer, the Intermediate Hawthorn Aquifer, and the Floridan Aquifer System. The Surficial Aquifer, which extends from near the surface to a depth of nearly 100 feet bgs at NAVSTA Mayport, is the first aquifer beneath SWMUs 12 and 17 and is the groundwater zone considered in this CMS. It includes all of the undifferentiated post-Hawthorn deposits (see Section 1.3.1) and consists of unconsolidated sand, shell, and clay, which vary horizontally and vertically in lithology, thickness, and permeability. It is recharged primarily by precipitation at a countywide estimated rate of 10 to 16 inches per year. Discharge in the vicinity of NAVSTA Mayport is primarily by seepage into surface water bodies and evapotranspiration. At SWMUs 12 and 17 the direction of groundwater flow in the Surficial Aquifer is toward the St. Johns River and the Mayport Turning Basin, respectively. It has also been reported that groundwater becomes brackish below a depth of 40 feet at NAVSTA Mayport.

The Surficial Aquifer is underlain by the Hawthorn Aquifer. The Hawthorn Aquifer consists of sand and limestone layers interbedded with clayey sand and sandy clay. It was noted in the RFI that the most productive limestone layer in the upper part of the Hawthorn Aquifer is absent in the Mayport area. Thus, the Intermediate Hawthorn Aquifer may be in hydraulic contact with the Surficial Aquifer at NAVSTA Mayport. Overall, the Hawthorn Group is a complex aquiclude that acts as a confining bed to the underlying Floridan Aquifer. The primary recharge mechanism for the Intermediate Hawthorn Aquifer is precipitation in areas approximately 30 miles to the west of NAVSTA Mayport where the Hawthorn Group sediments occurs at shallow depths. Because the Surficial Aquifer is the preferred pathway for groundwater flow and contaminant migration at NAVSTA Mayport, groundwater in the Intermediate Hawthorn Aquifer was not considered in the CMS.

The hydrogeology of SWMUs 12 and 17 was investigated during the RFI. A station-wide tidal study was performed, water levels were measured, the potentiometric surface was mapped at different points in time, aquifer conductivity testing was conducted, and aquifer material physical properties were tested. This information was presented in the RFI Reports for Groups II and III and is summarized below for SWMUs 12 and 17, respectively.

SWMU 12

- Wells MPT-11-MW01S, -02S, and -03S were included in the tidal effects study. A groundwater level amplitude up to 0.8 foot was observed at well MW03S. A time lag of approximately 7.5 to 11 hours relative to the tidal fluctuation was observed. No tidal effects on the water table zone were observed at well MW01S that is located about 400 feet from the St. Johns River at SWMU 12.

- The direction of groundwater flow was generally north toward the St. Johns River. Tidal influence on the direction of groundwater flow was not observed.

- Groundwater horizontal gradients for the Group II SWMUs ranged from 0.011 to 0.014 feet/foot; data from a well pair located at SWMU 8 (4,000 feet west of SWMU 12) used to investigate vertical gradients showed a range of 0.033 to 0.019 feet/foot between the shallow and intermediate well-depth zones for the 1993 and 1994 data, respectively. The values reflect a net downward gradient that suggests there is no significant artesian influence from the Floridan Aquifer system on the Surficial Aquifer.

- The average values for radial hydraulic conductivity in the Group II area (i.e., includes SWMU 12) ranged from 0.2 to 32 feet/day, with an average of 6 feet/day. No wells were tested at SWMU 12.

- The groundwater flow velocity for the Group II SWMUs ranged from approximately 0.19 feet/day (69 feet/year) to 0.24 feet/day (87 feet/year). The estimated vertical flow rate at SWMU 8 was 0.026 (10 feet/year).

- Testing of soil samples from the Group II SWMUs showed the following results: a pH of 6.28 to 8.17; cation exchange capacity of less than 0.6 to 2.5 milliequivalents (Meq) per 100 grams; and Total Organic Carbon (TOC) concentration of 1,140 to 8,030 milligrams per kilogram (mg/kg).

SWMU 17

- No wells at this SWMU were included in the tidal effects study. However, the study suggests that the Surficial Aquifer at SWMU 17 is unlikely to be affected by the tides because there are two layers of retaining walls constructed along the perimeter of the Mayport Turning Basin.

- Groundwater flow is generally to the east or northeast, toward the Mayport Turning Basin.

- The groundwater horizontal gradient in the vicinity of SWMU 17 was 0.0014 feet/foot; well pairs in the Shipyard area (SWMUs 23, 44 and 45) used to investigate the vertical gradient between the shallow and intermediate well-depth zones showed a typical range of 0.01 to 0.05 feet/foot using July 1995 data. The values reflect a net downward gradient that suggests there is no significant artesian influence from the Floridian Aquifer system on the Surficial Aquifer.

- The range for radial hydraulic conductivity in the Group III area (i.e., includes feet/day SWMU 17) was approximately 1.2 to 72.2 feet/day. Conductivity results specifically from wells MPT-11-MW01S, -02S, and -03S located at SWMU 17 ranged from approximately 7.2 to 10.2 feet/day with an average of 8.9 feet/day.

- Based on the RFI data, the groundwater flow velocity was estimated to be 0.036 feet/day (13 feet/year) across SWMU 17.

- Testing of a soil sample from SWMU 17 at a depth of 5 to 7 feet bgs showed the following results: a pH of 8.33, a cation exchange capacity of 0.8 Meq per 100 grams, and a TOC concentration of 691 mg/kg. These results were on the low end of the range for all Group III SWMU soil testing results.

1.3.3 Background Conditions

Background screening values were originally calculated and presented in the RCRA GIR for NAVSTA Mayport, Florida (ABB-ES, 1995b). The calculation was based on samples from each medium of concern including groundwater, surface soil, subsurface soil, sediment, and surface water. During review of the background data, it was determined that certain procedures used during the original background calculations were not consistent with current regulatory guidelines, and apparent spurious or problematic results were present in the data used to perform the calculations. A recalculation of the background screening values was therefore performed primarily to conform with newer regulatory guidance that recommends how nondetect concentrations are used in the mathematical treatment of the data (Tetra Tech NUS, 2000).

It was noted during review of the background data sets that many of the results for each medium sampled were below the detection limits of the laboratory methods used. Consequently, the use of one-half the detection limit for nondetect results in the recalculation methodology may result in an unnatural dilution of the mean concentration. Therefore, the background screening concentration was compared with the maximum background concentration in each medium's data set. If the screening concentration (i.e., 2 times the mean of the background data set) for a contaminant was less than the maximum concentration for that contaminant, then the background screening concentration for that contaminant was footnoted. For these contaminants, if a detection occurred in site media within the range of concentration between the screening concentration and the maximum concentration, then these contaminants received additional evaluation on a case by case basis to determine if the site detection represents the upper range of background or a site release. Tables 1-1 through 1-5 present the re-calculated background screening values for each medium at NAVSTA Mayport.

1.4 CORRECTIVE MEASURES STUDY METHODOLOGY

This CMS for SWMUs 12 and 17 uses the CMS process described in the CMS work plan (ABB-ES, 1995c) for NAVSTA Mayport with the incorporation of the newer USEPA guidance for conducting a CMS (USEPA, 1994). The purpose of the CMS is to identify, evaluate, and recommend corrective action for SWMUs that warrant such action based on the results of the RFI. The following key components were considered in identifying appropriate corrective action.

Investigation data documented in the station-wide GIR, the RFI reports, and subsequent IM programs conducted at the SWMUs of concern were reviewed to gain an understanding of the SWMU’s physical setting, past history, current conditions, and future land uses. All available, validated analytical data for all environmental media were assembled into a single CMS database.

TABLE 1-1
STATISTICS AND BACKGROUND SCREENING CONCENTRATIONS – SURFACE SOIL
NAVSTA MAYPORT, FLORIDA

Chemical	Frequency of Detection [1]	Range of Reporting Limits [2]	Range of Detected Concentrations [2]	Arithmetic Mean [3]	BG Screen [4]
Inorganics (mg/kg)					
Antimony	0 / 6	5.2 -- 6	-- [5]	ND [5]	ND [5]
Arsenic	0 / 6	0.76 -- 2.6	-- [5]	ND [5]	ND [5]
Barium	6 / 6	-- [6]	0.76 -- 5	2.75	5.50
Beryllium	1 / 6	0.06 -- 0.07	0.09	0.05	0.09
Cadmium	1 / 6	0.83 -- 0.96	1 -- 1	0.5	1.1
Chromium	6 / 6	-- [6]	0.68 -- 2.5	1.3	2.6
Cobalt	0 / 6	0.47 -- 0.55	-- [5]	ND [5]	ND [5]
Copper	1 / 6	0.35 -- 0.41	2.1	0.35	**0.69** [7]
Cyanide	0 / 6	0.16 -- 0.18	-- [5]	ND [5]	ND [5]
Lead	0 / 6	0.25 -- 1.7	-- [5]	ND [5]	ND [5]
Mercury	0 / 6	0.03 -- 0.07	-- [5]	ND [5]	ND [5]
Nickel	0 / 6	2.6 -- 3	-- [5]	ND [5]	ND [5]
Selenium	5 / 6	0.45 -- 0.45	0.47 -- 0.86	0.6	1.2
Silver	0 / 6	0.51 -- 0.59	-- [5]	ND [5]	ND [5]
Thallium	4 / 6	0.53 -- 0.62	0.77 -- 1.1	0.7	1.4
Tin	0 / 6	7.3 -- 8.5	-- [5]	ND [5]	ND [5]
Vanadium	5 / 6	0.46 -- 0.46	1.2 -- 2.5	1.7	3.4
Zinc	6 / 6	-- [6]	0.35 -- 1.9	1.3	2.7
Miscellaneous Parameters (mg/kg)					
Total Organic Carbon	6 / 6	-- [6]	1,440 -- 8,030	3,499	**6,998** [7]

1 Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed (excluding rejected results); duplicates included but not counted.
2 Ranges include duplicate and/or re-sample results, where appropriate.
3 The mean includes detected concentrations and one-half the laboratory reporting limit for nondetect results; duplicate samples and re-sample results were averaged prior to calculation of the mean.
4 Background (BG) Screen is twice the arithmetic mean of the data.
5 All results were nondetects (ND); mean and BG screening value not applicable.
6 All results were positive detects.
7 Bold BG Screen result indicates that value is less than maximum concentration of that chemical.

TABLE 1-2
STATISTICS AND BACKGROUND SCREENING CONCENTRATIONS – SUBSURFACE SOIL
NAVSTA MAYPORT, FLORIDA

Chemical	Frequency of Detection [1]	Range of Reporting Limits [2]	Range of Detected Concentrations [2]	Arithmetic Mean [3]	BG Screen [4]
Inorganics (mg/kg)					
Antimony	0 / 4	1.1 -- 1.2	-- [5]	ND [5]	ND [5]
Arsenic	3 / 4	0.13 -- 0.13	0.33 -- 0.58	0.35	0.70
Barium	4 / 4	-- [6]	1.9 -- 6.8	3.6	7.2
Beryllium	1 / 4	0.07 -- 0.07	0.07	0.04	0.09
Cadmium	0 / 4	0.22 -- 0.23	-- [5]	ND [5]	ND [5]
Chromium	3 / 4	0.57 -- 0.57	1.4 -- 3	1.4	2.7
Cobalt	1 / 4	0.67 -- 0.72	0.71	0.4	0.8
Copper	2 / 4	0.2 -- 0.9	1.4 -- 2.3	1.0	**2.1** [7]
Cyanide	1 / 4	0.15 -- 0.16	0.58	0.1	**0.3** [7]
Lead	2 / 4	0.58 -- 0.59	0.75 -- 1.9	0.83	**1.66** [7]
Mercury	3 / 4	0.03 -- 0.03	0.03 -- 0.03	0.02	0.05
Nickel	0 / 4	1.3 -- 1.4	-- [5]	ND [5]	ND [5]
Selenium	0 / 4	0.13 -- 0.14	-- [5]	ND [5]	ND [5]
Silver	0 / 4	0.45 -- 0.49	-- [5]	ND [5]	ND [5]
Thallium	0 / 4	0.13 -- 0.14	-- [5]	ND [5]	ND [5]
Tin	4 / 4	-- [6]	2.2 -- 4	2.7	5.4
Vanadium	4 / 4	-- [6]	0.71 -- 2.5	1.6	3.1
Zinc	4 / 4	-- [6]	2 -- 2.9	2.4	4.9

1 Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed (excluding rejected results); duplicates included but not counted.
2 Ranges include duplicate and/or re-sample results, where appropriate.
3 The mean includes detected concentrations and one-half the laboratory reporting limit for nondetect results; duplicate samples and re-sample results were averaged prior to calculation of the mean.
4 Background (BG) Screen is twice the arithmetic mean of the data.
5 All results were nondetects (ND); mean and BG screening value not applicable.
6 All results were positive detects.
7 Bold BG Screen result indicates that value is less than maximum concentration of that chemical.

TABLE 1-3
STATISTICS AND BACKGROUND SCREENING CONCENTRATIONS – GROUNDWATER
NAVSTA MAYPORT, FLORIDA

Chemical	Frequency of Detection [1]	Range of Reporting Limits [2]	Range of Detected Concentrations [2]	Arithmetic Mean [3]	BG Screen [4]
Inorganics (mg/L)					
Arsenic	5 / 8	0.6 -- 6	0.6 -- 6	2.6	**5.3** [5]
Antimony	0 / 8	2.2 -- 50	-- [6]	ND [6]	ND [6]
Barium	5 / 8	1.2 -- 3.3	6.4 -- 75.5	18.9	**37.8** [5]
Beryllium	0 / 8	0.18 -- 0.3	-- [6]	ND [6]	ND [6]
Cadmium	0 / 8	1 -- 3	-- [6]	ND [6]	ND [6]
Calcium	8 / 8	-- [7]	65,000 -- 251,000	113,063	**226,125** [5]
Chromium	0 / 8	2 -- 2.6	-- [6]	ND [6]	ND [6]
Cobalt	0 / 8	2.7 -- 3.1	-- [6]	ND [6]	ND [6]
Copper	0 / 8	0.9 -- 12.7	-- [6]	ND [6]	ND [6]
Cyanide	1 / 8	0.81 -- 2.7	0.95	1	2
Iron	6 / 8	68.2 -- 78.6	15.4 -- 660	247	**494** [5]
Lead	1 / 8	0.6 -- 6	1.5	1	2
Magnesium	6 / 8	18,800 -- 19,700	28,60 -- 419,000	92,196	**184,393** [5]
Manganese	6 / 8	20.1 -- 23.6	7.1 -- 228	70	**141** [5]
Mercury	2 / 8	0.08 -- 0.5	0.08 -- 0.1	0.08	0.16
Nickel	0 / 8	5.9 -- 7.3	-- [6]	ND [6]	ND [6]
Selenium	0 / 6	0.6 -- 13.2	-- [6]	ND [6]	ND [6]
Silver	0 / 8	2.1 -- 2.3	-- [6]	ND [6]	ND [6]
Sodium	6 / 8	31,500 -- 39,500	9,300 -- 3,310,000	762,294	**1,524,588** [5]
Thallium	0 / 8	0.6 -- 6	-- [6]	ND [6]	ND [6]
Tin	0 / 8	8 -- 9.4	-- [6]	ND [6]	ND [6]
Vanadium	6 / 8	1.5 -- 1.7	2.3 -- 5.8	3	6
Zinc	1 / 8	1.82 -- 8.8	4.3	2.9	5.8
Miscellaneous Parameters (mg/L)					
Ammonia, as nitrogen	3 / 3	-- [7]	0.7 -- 1.3	1.0	2.1
Chloride	6 / 6	-- [7]	15 -- 6,600	1,142	**2,284** [5]
Sulfate	6 / 6	-- [7]	36.4 -- 1,230	257	514
Total dissolved solids	6 / 6	-- [7]	417 -- 8,150	1,881	3,762

1 Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed (excluding rejected results); duplicates included but not counted.
2 Ranges include duplicate and/or re-sample results, where appropriate.
3 The mean includes detected concentrations and one-half the laboratory reporting limit for nondetect results; duplicate samples and re-sample results were averaged prior to calculation of the mean.
4 Background (BG) Screen is twice the arithmetic mean of the data.
5 Bold BG Screen result indicates that value is less than maximum concentration of that chemical.
6 All results were nondetects (ND); mean and BG screening value not applicable.
7 All results were positive detects.

TABLE 1-4
STATISTICS AND BACKGROUND SCREENING CONCENTRATIONS – SEDIMENT
NAVSTA MAYPORT, FLORIDA

Chemical	Frequency of Detection [1]	Range of Reporting Limits [2]	Range of Detected Concentrations [2]	Arithmetic Mean [3]	BG Screen [4]
Inorganics (mg/kg)					
Antimony	0 / 8	0.94 -- 18.2	-- [5]	ND [5]	ND [5]
Arsenic	4 / 8	0.01 -- 0.21	0.68 -- 6.6	1.2	**2.5** [6]
Barium	8 / 8	0 -- 0	3.6 -- 16.1	7.2	**14.3** [6]
Beryllium	2 / 8	0.045 -- 0.59	0.1 -- 0.47	0.1	**0.2** [6]
Cadmium	1 / 8	0.44 -- 1.3	0.82	0.5	0.9
Chromium	8 / 8	0 -- 0	1.3 -- 28.1	7.3	**14.7** [6]
Cobalt	1 / 8	0.56 -- 6.4	2.4	1.0	**2.0** [6]
Copper	7 / 8	0.43 -- 0.43	0.88 -- 7.5	2.5	**5.0** [6]
Cyanide	0 / 5	0.07 -- 0.22	-- [5]	ND [5]	ND [5]
Lead	6 / 8	0.2 -- 1.2	1.5 -- 10	3.4	**6.8** [6]
Mercury	3 / 8	0.04 -- 0.24	0.22 -- 1.1	0.2	**0.3** [6]
Nickel	3 / 8	2 -- 3.6	5.1 -- 7.1	3.1	**6.2** [6]
Selenium	6 / 8	0.56 -- 1.1	0.32 -- 0.81	0.5	1.1
Silver	0 / 8	0.6 -- 1.1	-- [5]	ND [5]	ND [5]
Thallium	1 / 8	0.39 -- 0.74	0.88	0.3	**0.7** [6]
Tin	1 / 8	5 -- 94.8	12.3	17.9	35.8
Vanadium	8 / 8	-- [7]	1.6 -- 28.4	7.1	**14.3** [6]
Zinc	8 / 8	-- [7]	2.1 -- 34.3	12.1	**24.2** [6]
Miscellaneous Parameters (mg/kg)					
Total organic carbon	5 / 5	-- [7]	5,160 -- 20,400	9,364	**18,728** [6]

1 Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed (excluding rejected results); duplicates included but not counted.
2 Ranges include duplicate and/or re-sample results, where appropriate.
3 The mean includes detected concentrations and one-half the laboratory reporting limit for nondetect results; duplicate samples and re-sample results were averaged prior to calculation of the mean.
4 Background (BG) Screen is twice the arithmetic mean of the data.
5 All results were nondetects (ND); mean and BG screening value not applicable.
6 Bold BG Screen result indicates that value is less than maximum concentration of that chemical.
7 All results were positive detects.

TABLE 1-5
STATISTICS AND BACKGROUND SCREENING CONCENTRATIONS – SURFACE WATER
NAVSTA MAYPORT, FLORIDA

Chemical	Frequency of Detection [1]	Range of Reporting Limits [2]	Range of Detected Concentrations [2]	Arithmetic Mean [3]	BG Screen [4]
Inorganics (μg/L)					
Antimony	1 / 8	3.1 -- 40	57.5	17.5	**35** [5]
Arsenic	5 / 8	0.9 -- 6.9	0.86 -- 8.1	2.8	**5.6** [5]
Barium	8 / 8	-- [6]	6.8 -- 15.4	11.4	22.9
Beryllium	0 / 8	0.1 -- 0.27	-- [7]	ND [7]	ND [7]
Cadmium	1 / 8	1.6 -- 4	2.4	1.6	3.1
Calcium	4 / 4	* -- [6] *	71,100 -- 168,000	141,088	282,175
Chromium	1 / 8	1.9 -- 2.4	4	1.3	**2.6** [5]
Cobalt	2 / 8	2.3 -- 5.1	5.6 -- 9.7	3.2	**6.4** [5]
Copper	3 / 8	1.4 -- 29.5	2.4 -- 37.2	7.2	**14.5** [5]
Cyanide	2 / 8	1.8 -- 3	0.92 -- 3.0	1.5	3.0
Iron	3 / 4	187 -- 187	85.7 -- 435	193	**386** [5]
Lead	2 / 4	0.78 -- 2.6	0.91 -- 1.5	1.0	2.1
Magnesium	4 / 4	-- [6]	54,000 -- 490,000	335,575	671,150
Manganese	4 / 4	-- [6]	10.4 -- 98.7	41.7	**83.5** [5]
Mercury	0 / 8	0.09 -- 0.16	-- [7]	ND [7]	ND [7]
Nickel	1 / 8	7 -- 19.8	13 -- 13	6.3	**12.6** [5]
Selenium	3 / 8	1.1 -- 10.6	1.8 -- 13.7	4.3	**8.5** [5]
Silver	0 / 8	2.1 -- 2.4	-- [7]	ND [7]	ND [7]
Sodium	1 / 4	55.6 -- 55.6	386,000	95,771	**191,542** [5]
Thallium	2 / 5	1.4 -- 1.4	1.8 -- 73.7	10.0	**19.9** [5]
Tin	1 / 8	9.4 -- 208	776	108	**216** [5]
Vanadium	6 / 8	2.2 -- 2.7	3.4 -- 5.2	3.2	6.4
Zinc	1 / 8	1.6 -- 23.5	3.2	4.4	8.8
Miscellaneous Parameters (mg/L)					
Chloride	5 / 5	-- [6]	710 -- 11,500	6,075.0	12,150
Sulfate	5 / 5	-- [6]	130 -- 1,320	839	1,679
Total dissolved solids	4 / 4	-- [6]	1,550 -- 18,600	11,263	22,525
Total organic carbon	4 / 4	-- [6]	10.8 -- 21.6	15	29

1 Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed (excluding rejected results); duplicates included but not counted.
2 Ranges include duplicate and/or re-sample results, where appropriate.
3 The mean includes detected concentrations and one-half the laboratory reporting limit for nondetect results; duplicate samples and re-sample results were averaged prior to calculation of the mean.
4 Background (BG) Screen is twice the arithmetic mean of the data.
5 Bold BG Screen result indicates that value is less than maximum concentration of that chemical.
6 All results were positive detects.
7 All results were nondetects (ND); mean and BG screening value not applicable.

- CAOs. CAOs are developed to specify the contaminants, media of interest, exposure pathways, and corrective action goals for a SWMU.

- MCSs. MCSs are developed based on regulatory requirements, when available, site-specific risk-based factors, or other available information (e.g., leachability of contaminants from soil to groundwater). MCS were derived for both human and ecological receptors from information presented in the RFI and IM reports, or were developed based on the State of Florida 62-777, F.A.C. Cleanup Target Level (CTL) criteria for each medium of concern.

- COCs. Contaminants detected in the media of concern were compared against promulgated regulatory standards or other applicable or relevant and appropriate requirements (ARARs) criteria to identify COPCs in each environmental medium for both human and ecological receptors. COCs are developed from the list of COPCs determined in the RFI Report or as updated in the CMS. COCs define the contaminants that will be evaluated for corrective action in the CMS.

- Volumes of Media of Concern. The volumes (or areas) of media of concern at each SWMU are determined by considering the requirements for protectiveness as identified in the CAOs and the chemical and physical characterization of the site (i.e., the results and conclusions of the RFI and post-RFI activities). Essentially, the area and depth of a given medium containing concentrations of COCs that exceed the MCSs were used to define the volumes of media of concern.

- Applicable Technologies. Technologies applicable to contaminated media at each SWMU are identified and screened. Technologies that cannot be implemented technically are eliminated.

- Corrective Measure Alternatives. Technologies that pass the screening phase are assembled into corrective measure alternatives.

- Evaluation of Corrective Measure Alternatives. Recommended corrective measure alternatives are described and evaluated using four criteria: technical, environmental, human health, and institutional factors.

- Recommendation of Corrective Action. The results of the evaluation of alternatives are summarized and a corrective action is recommended for each SWMU.

These components are described further in the CMS work plan for NAVSTA Mayport (ABB-ES, 1995c). More detailed discussion of the methodology for CAOs, MCSs, COCs, and COPCs used in this CMS is provided in the following sections.

1.4.1 Corrective Action Objectives

CAOs are aimed at protecting human health and the environment and are expressed for each medium of concern. At SWMUs 12 and 17 the media of concern for the CMS included groundwater, surface soil, subsurface soil, and surface water. CAOs were based on the COPCs, the exposure pathway, and the present and future receptors at each SWMU. Development of the CAOs considered the results of the RFI, particularly the human health and ecological risk assessments, as well as the applicable Federal and State standards.

For this CMS, CAOs were formulated based on unacceptable human health and ecological risk that exist for direct exposure to groundwater, surface or subsurface soil, and surface water based on the current and anticipated future use of the sites. All exposure scenarios for human health receptors used the Chapter 62-777, F.A.C. CTL's criteria. Exposure scenarios for ecological receptors were developed in the RFI and IM reports and used ecological benchmarks consistent with current values applicable and relevant to the State of Florida. The current and future use of the property at both SWMUs 12 and 17 is industrial. The current and future receptors are commercial/industrial workers and shoreline benthic aquatic receptors in the St. Johns River and Mayport Turning Basin; potential exposure of terrestrial ecological receptors was not considered a pathway of concern in the RFI for these SWMUs. Based on the current and future use receptors, the following CAOs were developed for SWMUs 12 and 17.

Groundwater

CAO 1: Prevent ingestion of aquifer groundwater containing carcinogens in excess of State Groundwater Cleanup Target Levels (GCTLs) (62-777, F.A.C.) for groundwater criteria until CAO 3 has been met. The cumulative risk for all COCs shall not exceed an excess lifetime cancer risk (ELCR) of 1.0×10^{-6} for residential/industrial exposure to groundwater.

CAO 2: Prevent ingestion of aquifer groundwater containing noncarcinogens in excess of the State of Florida GCTLs (62-777, F.A.C.) groundwater criteria until CAO 3 has been met. The Hazard Quotient (HQ) for each contaminant shall not exceed 1.0 for the residential/industrial exposure to groundwater. The Hazard Index (HI) (which is the sum of the HQs) shall not exceed 1.0 for the residential/industrial exposure to groundwater.

CAO 3: Restore the groundwater aquifer to the State of Florida GCTLs (62-777, F.A.C.) for groundwater criteria.

Soil

CAO 4: Protect human health from carcinogenic and noncarcinogenic risks associated with incidental ingestion of, inhalation of, and dermal contact with contaminated soil or sediment in excess of the State of Florida Soil Cleanup Target Levels (SCTLs) (62-777, F.A.C.) for commercial/industrial criteria. The cumulative risk for all COCs shall not exceed an ELCR of 1.0×10^{-6} for industrial exposure to soil or sediment. The HQ for each contaminant shall not exceed 1.0 for industrial exposure to soil or sediment. The HI (which is the sum of the HQs) shall not exceed 1.0 for industrial exposure to soil or sediment.

CAO 5: Prevent leaching of contaminants from soil that would result in groundwater concentrations that do not meet CAOs for groundwater.

CAO 6: Protect the environment from COCs in the soil that cause adverse biological effects.

Surface Water

CAO 7: Protect the environment from COCs in the surface water that cause adverse biological effects.

1.4.2 Media Cleanup Standards

MCSs establish acceptable exposure levels that are protective of human health and the environment and were estimated for SWMUs 12 and 17 using baseline assumptions and inputs. MCSs are determined based on Federal and State standards, contaminants and media of interest, and exposure pathways. These calculations are based on the State of Florida CTLs (62-777, F.A.C.), background screening values, and assumptions regarding ultimate land uses. The current and future use of both SWMUs 12 and 17 is for industrial purposes; therefore, the exposure pathways are to commercial/industrial workers. Specifically MCSs are used to determine COCs, to estimate areas and volumes of impacted media, and to set performance standards for potential remedial alternatives.

Cleanup of inorganic contaminants below their established background concentrations will not be performed; therefore, background-screening values will be used as the lower limit for MCSs. The MCSs selection criteria are summarized below for each medium.

Groundwater

- The lower of the State of Florida GCTLs (Chapter 62-777, F.A.C.) for groundwater criteria and, when applicable, groundwater discharging into fresh or marine surface water criteria.

- NAVSTA Mayport background screening values will be used as the lower limit for the MCSs of inorganic COCs.

Soil

- The lower of the State of Florida SCTLs (Chapter 62-777, F.A.C.) for commercial/industrial direct exposure or for leachability to groundwater.

- NAVSTA Mayport background screening values will be used as the lower limit for the MCSs of inorganic COCs.

Surface Water

- The State of Florida GCTLs (Chapter 62-777, F.A.C.) for fresh or marine surface water criteria.

- NAVSTA Mayport background screening values will be used as the lower limit for the MCSs of inorganic COCs.

1.4.3 Contaminants of Concern

The determination of COCs for each medium involves a three-step process:

1. Determine the Contaminants of Interest (COIs).
2. Identify the COPCs.
3. Select the COCs.

COIs and COPCs were determined in the RFI; however, since the RFI was issued additional data have been collected and new regulations have been promulgated. Therefore, the COIs and COPCs are reevaluated.

1.4.3.1 Contaminants of Interest

The COIs include any contaminant detected at least once in validated analytical results for environmental samples in any medium at the site during any sampling event. For this CMS, the list of COIs originally presented in the RFI was revised by including any contaminants that were detected during any environmental sampling program conducted after the RFI (e.g., IM actions). The lists of COIs for SWMUs 12 and 17 are presented in Sections 2 and 3, respectively.

1.4.3.2 Contaminants of Potential Concern

The selection of COPCs was based on the list of COIs and considered the concentration, occurrence, and distribution of contaminants detected in the environmental media and the environmental conditions at SWMUs 12 and 17. The COPC selection considered all available validated soil, groundwater, sediment, and surface water sample results and included several rounds of sampling conducted after the RFI Report was submitted.

Calcium, magnesium, potassium, and sodium were considered to be essential human nutrients and were not considered in the COPC selection process. In addition, several water quality parameters that were measured during the groundwater analyses were not evaluated, including alkalinity, hardness, sulfide, total dissolved solids (TDS), total Kjeldahl nitrogen (TKN), TOC, and total phosphorus.

Soil and Sediment

The COPC selection process for soil and sediment was conducted in two separate evaluations: direct exposure and leachability. The direct exposure evaluation was performed in a two step process: initial COPCs and final COPCs. Chapter 62-777, F.A.C. requires that the CTLs for direct exposure be adjusted when more than one noncarcinogen that affects the same target organ or more than one carcinogen are present.

For direct exposure, the published CTLs provided in Chapter 62-777, F.A.C. were adjusted to account for multiple noncarcinogens present in a given medium that affected the same target organ/system and for multiple carcinogens. For these COIs, the published CTL values were divided by the number of carcinogens or the number of noncarcinogens affecting the same target organ/system to determine an "initial target level." The maximum detected concentration for each COI was compared to the "initial target level" to determine the initial COPCs. The list of COIs was also screened to eliminate common laboratory contaminants, to eliminate samples of poor quality or which provided spurious results, and on the basis of low frequency of detection (less than 5 percent). Also, contaminants whose maximum concentration was less than the background screening value (or under certain conditions, contaminants whose maximum concentration was within the background range) were screened out. Tables 1-1, 1-2, and 1-4 present background screening values for surface soil, subsurface soil, and sediment, respectively, that were developed for NAVSTA Mayport. A final direct exposure COPC determination was performed by determining the cumulative effects of the contaminants. The maximum concentration for all initial COPCs was divided by the SCTL to make a ratio. The ratios for contaminants that affect the same target organ or that are carcinogens were summed together (cumulative effect). If the sum of the ratios was less than 1, then all carcinogenic contaminants or noncarcinogenic contaminants affecting the same target organ were removed from further consideration as COPCs. If the sum of the ratios equaled or exceeded 1, then all of the contaminants were retained as COPCs.

For leachability, the maximum concentration for each COI was compared to the leachability table value in Chapter 62-777, F.A.C. The list of COIs was also screened to eliminate common laboratory contaminants, to eliminate samples of poor quality or which provided spurious results, and on the basis of low frequency of detection (less than 5 percent). Also, contaminants whose maximum concentration was less than the background screening value (or under certain conditions, contaminants whose maximum concentration was within the background range) were screened out. If the maximum concentration exceeded the leachability CTL, then the contaminant became a COPC.

Groundwater and Surface Water

The COPC selection process for groundwater and surface water was performed following a similar two step process that was used for soil and sediment. Contaminants that had a primary or secondary standard were handled differently than contaminants without a standard. For groundwater that discharges into surface water, an additional evaluation was performed.

For contaminants without a primary or secondary standard, the published GCTLs provided in Chapter 62-777, F.A.C. were adjusted to account for multiple noncarcinogens present that affected the same target organ/system and for multiple carcinogens. For the COIs without a primary or secondary standard, the published GCTL was divided by the number of carcinogens or the number of noncarcinogens affecting the same target organ/system to determine an “initial target level.” The maximum detected COI concentration was compared to the “initial target level” to determine the initial COPCs. The list of COIs was also screened to eliminate common laboratory contaminants, to eliminate samples of poor quality or which provided spurious results, and on the basis of low frequency of detection (less than 5 percent). Also, contaminants whose maximum concentration was less than the background screening value (or under certain conditions, contaminants whose maximum concentration was within the background range) were screened out. Tables 1-3 and 1-5 present background screening values for groundwater and surface water, respectively, that were developed for NAVSTA Mayport.

For the final COPC determination (for all initial COPCs without a primary or secondary standard), the maximum concentration was divided by the GCTL to form a ratio. The contaminants that affect the same target organ or that are carcinogens were summed together (cumulative effect). If the sum of the ratios was less than 1, then all carcinogenic contaminants or noncarcinogenic contaminants affecting the same target organ were removed from further consideration as COPCs. If the sum of the ratios equaled or exceeded 1, then all of the contaminants were retained as COPCs.

For contaminants with a primary or secondary standard, the maximum concentration was compared to the GCTL. The list of COIs was also screened to eliminate common laboratory contaminants, to eliminate samples of poor quality or which provided spurious results, and on the basis of low frequency of detection (less than 5 percent). Also, contaminants whose maximum concentration was less than the background screening value, or under certain conditions, contaminants whose maximum concentration was within the background range, were screened out. A contaminant with a primary or secondary standard became a COPC if the maximum concentration exceeded the GCTLs listed in Chapter 62-777, F.A.C.

For groundwater that discharges into surface water, the maximum concentration for each COI was compared to either the Freshwater Surface Water Criteria or the Marine Surface Water Criteria table value in Chapter 62-777, F.A.C. depending on the groundwater discharge point. The list of initial COIs was also screened to eliminate common laboratory contaminants, to eliminate samples of poor quality or which provided spurious results, and on the basis of low frequency of detection (less than 5 percent). Also, contaminants whose maximum concentration was less than the background screening value, or under certain conditions, contaminants whose maximum concentration was within the background range, were screened out. If the maximum concentration exceeded the Freshwater Surface Water Criteria or the Marine Surface Water Criteria CTL, then the contaminant became a COPC.

1.4.3.3 Selection of Contaminants of Concern

The list of contaminants identified as COPCs may not represent a true picture of the media-specific contaminant concentrations or realistic risk exposure at a site. In order to represent overall contaminant concentration levels and exposures, COCs were developed from the list of COPCs. COCs were determined by comparing a representative concentration for each COPC to the adjusted CTL value from Chapter 62-777, F.A.C. In addition, the representative concentration was compared to the background value.

For groundwater, multiple samples were collected from the same well location. A quantitative trend analysis was performed to determine if the contaminant concentrations in groundwater have decreased over time and to provide a single concentration value for use in determining the representative concentration for each COPC. The trend analysis was performed by reviewing all the data for a contaminant at a single location to determine if the contaminant concentration was decreasing over a minimum of three sampling events. If the trend analysis indicated a decreasing contaminant concentration, then the most recent, lower concentration was used as the contaminant concentration for estimating the representative concentration. If the trend analysis did not indicate a decreasing trend in the contaminant concentration, then the maximum value was used for estimating the representative concentration for that contaminant.

The representative concentration was calculated by statistically estimating the 95 percent Upper Confidence Level (UCL) for the trend-adjusted data for the COPC. If a minimum of 10 samples of a given media were collected and analyzed at a site, then a calculation was performed to determine the 95 percent UCL concentration for that contaminant. The 95 percent UCL was then used as the site representative concentration for final comparison to the specific MCSs for each media. COPCs whose representative concentration exceeded the MCSs and background value were then selected as the COCs to be evaluated in the CMS.

The list of contaminants identified as COPCs may not represent a true picture of the media-specific contaminant concentrations or realistic risk exposure at a site. In order to represent overall contaminant concentration levels and exposure, COCs were developed from the list of COPCs by first statistically calculating a SWMU-specific representative concentration for each COPC, where appropriate. Because the sample population for all media at both SWMUs 12 and 17 were less than 10, a statistical site-representative concentration could not be calculated. Therefore, the maximum concentration was used as the representative concentration for all media at both SWMUs.

The site representative concentration (maximum concentration of each COPC) was compared to the site-specific MCSs for each medium. The MCSs for each medium were calculated as the published CTLs divided by the number of carcinogenic COPCs or the number of noncarcinogenic COPCs that affect the same target organ/system, or were the Mayport Background Screening Concentration, whichever was larger. COPCs whose representative concentration exceeded the MCSs were then selected as the COCs to be evaluated in the CMS.

2.0 SWMU 12, NEUTRALIZATION BASIN

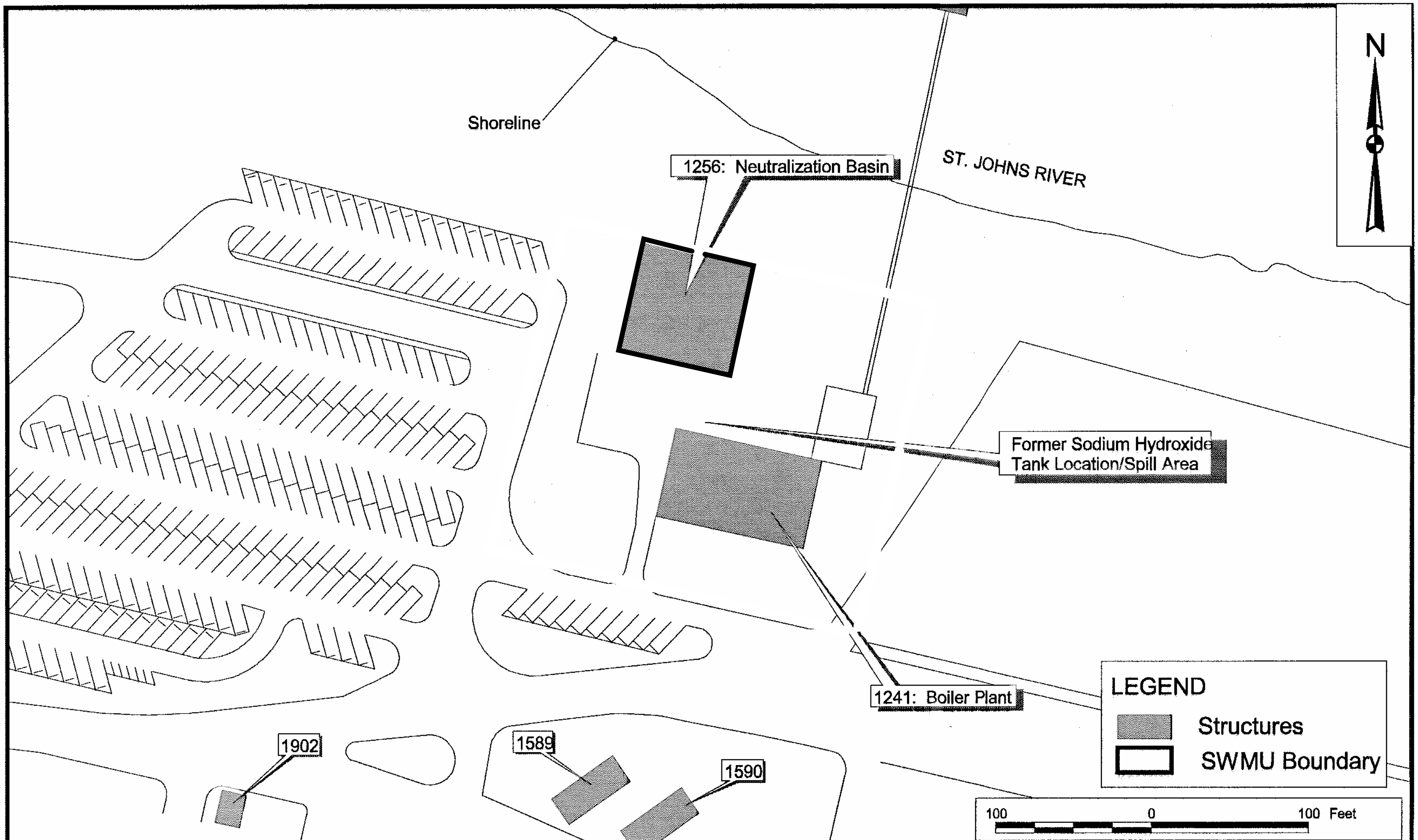
SWMU 12, the Neutralization Basin, is located in the northern part of NAVSTA Mayport along the shoreline of the St. Johns River (see Figure 1-2). The Neutralization Basin at SWMU 12 is located approximately 40 feet north of Boiler Building 1241 and 75 feet south of the river (Figure 2-1).

The construction of the original Neutralization Basin at the current site was completed in 1971. This basin had an asphalt base covered with a synthetic liner. The original basin was damaged by a storm in 1985. Because of the damage, in 1986 the original basin material was removed and the existing Neutralization Basin was constructed on the same site.

The existing basin is approximately 59 feet wide and 78 feet long, and it is divided into two cells each having a depth of 6 feet. The capacity of the basin is approximately 112,300 gallons with a 1.5-foot freeboard. The thickness of the concrete base is approximately 6 inches with sloping sidewalls approximately 4 inches thick. According to the construction design documents, the thickness of the compacted soil (95 percent of the modified proctor) beneath the concrete base material is 12 inches. A Hypalon® liner was placed over the concrete base and sidewalls.

The Neutralization Basin was originally constructed to receive and neutralize backwash from regeneration of ion-exchange columns in the boiler plant. The neutralized wastewater was then discharged to the NAVSTA Mayport sanitary sewer system. The ion-exchange regeneration system was subsequently redesigned to accomplish neutralization prior to discharge into the basin. From July 1990 to January 1992, the basin was used for flow equalization and received, temporarily stored, and pretreated, waste regeneration fluid from the newly adopted ion-exchange process used in the boiler plant before being discharged to the NAVSTA Mayport sanitary sewer system. In January 1992, this process was discontinued and the Neutralization Basin was removed from service.

In 1992, a release of sodium hydroxide occurred when the Neutralization Basin's sodium hydroxide tank was being removed from service. The tank was not completely emptied before removal due to a faulty pump; the accidental release resulted in a spill of approximately 300 gallons of sodium hydroxide on the ground. The release occurred about 20 feet east of the southeastern corner of the Neutralization Basin and 40 feet north of the boiler plant (Building 1241). Subsequently, stressed vegetation was observed in the vicinity of the spill. A 6- to 9-inch-thick layer of soil was placed over the release area and the soil was seeded.



DRAWN BY J. BELLONE — DATE 1/29/01	Tetra Tech NUS, Inc.	CONTRACT NUMBER N0455	OWNER NUMBER —
CHECKED BY — DATE —	GENERAL LOCATION AND SITE FEATURES SWMU 12 - NEUTRALIZATION BASIN NAVAL STATION MAYPORT MAYPORT, FLORIDA	APPROVED BY — DATE —	
COST/SCHEDULE-AREA		APPROVED BY — DATE —	
SCALE AS NOTED		DRAWING NO. FIGURE 2-1	REV 0

P:\GIS\MAYPORT\SWMU12-17_CMS3 APP\FIG 2-1_GENERAL LOCATION AND SITE FEATURES_SWMU 12 JCB 3/27/01

An RFI and a study to support a RCRA CCED Petition have been conducted at SWMU 12. The activities associated with SWMU 12 are described in Section 2.1. The general site features are shown in Figure 2-1.

2.1 DESCRIPTION OF CURRENT CONDITIONS

The description of current conditions is based on descriptions and data presented in the RFI and subsequent environmental programs conducted at SWMU 12 since the completion of the RFI. This information is summarized in the following sections; however, the original documents should be reviewed for further details and in-depth analyses of the data herein presented. The information and analytical data from all of these sources were utilized to form an up-to-date understanding of the current conditions at SWMU 12 from which COCs were identified and for which corrective actions were recommended.

2.1.1 RCRA Facility Investigation

The RFI field activities were conducted by ABB Environmental Services, Inc. (ABB-ES), in 1993 and 1994. Field activities consisted of installation of one groundwater monitoring well (MW-11-MW03S). The collection of groundwater samples from the two existing and the one new, shallow monitoring wells (MW-11-MW01S, MW-11-MW02S, and MW-11-MW03S) was conducted in both 1993 and 1994.

2.1.1.1 RFI Evaluation

Information regarding the investigation methods and sampling procedures are provided in the NAVSTA Mayport GIR (ABB-ES, 1995b) and in the NAVSTA Mayport RFI Workplan (ABB-ES, 1991). In 1993, three groundwater samples and a duplicate sample were collected from monitoring wells. A bailer was used to purge the monitoring wells and collect the groundwater samples. The groundwater samples and the associate duplicate were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), inorganics, cyanide, and water quality parameters (Table 2-1). In 1994, groundwater samples were collected from the same three monitoring wells. Low-flow sampling with a peristaltic pump was used to purge the monitoring wells and collect the aliquots to be analyzed for SVOCs, pesticides, PCBs, and inorganics. Bailers were used only to collect the aliquot for VOCs. The three samples for inorganic analysis were split and the unfiltered samples were analyzed for VOCs, SVOCs, pesticides, PCBs, inorganics, cyanide, and water quality parameters. The filtered samples were analyzed for inorganics only. Figure 2-2 depicts the locations of environmental samples collected during the RFI and subsequent investigations.

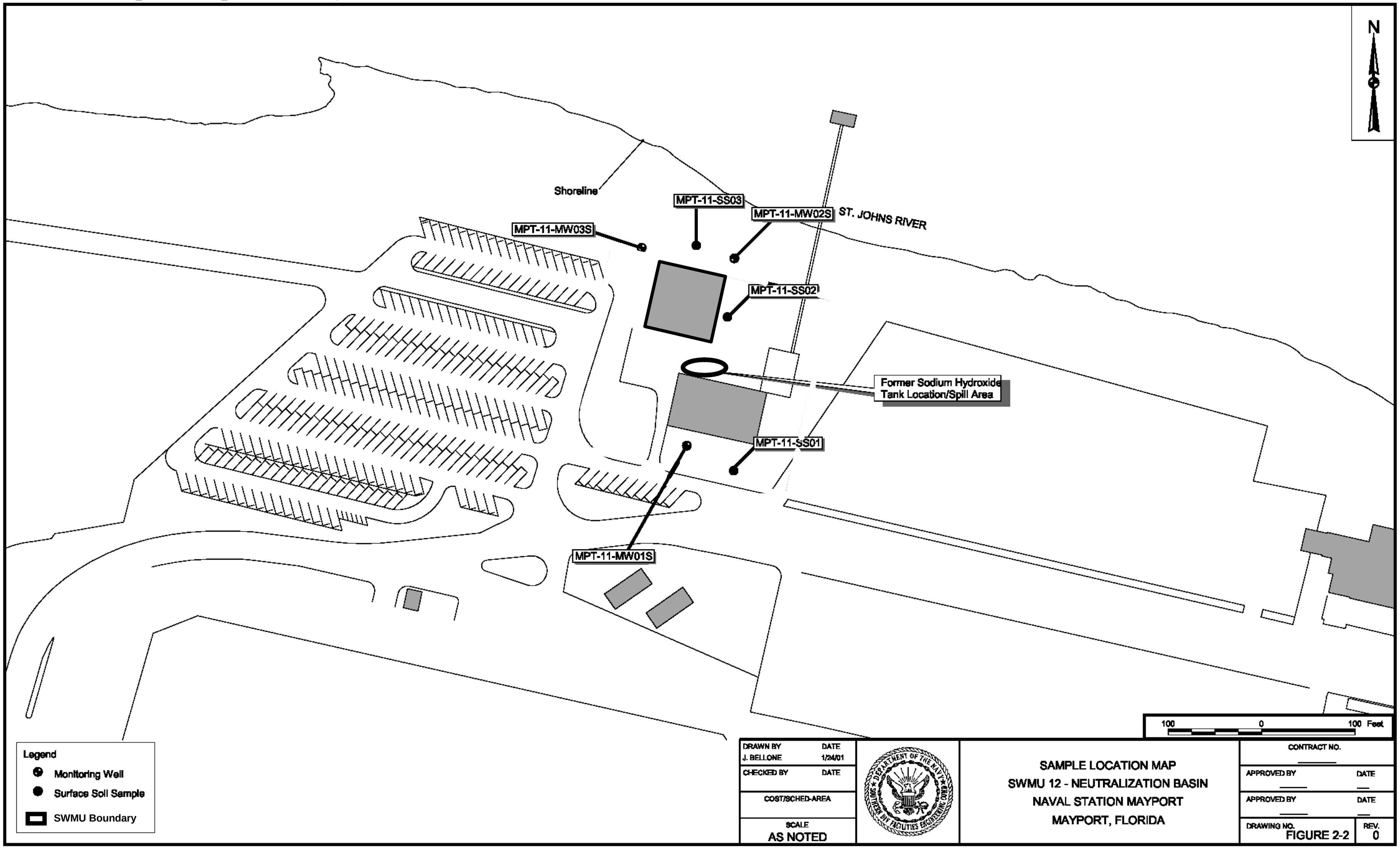
TABLE 2-1
SWMU 12, SOIL AND GROUNDWATER SAMPLE IDENTIFICATION
NAVSTA MAYPORT, FLORIDA

Sample Location	Sample ID	Sample Date	Volatile Organics	Semivolatile Organics	Inorganics	Pesticides	Total Petroleum Hydrocarbons	Water Quality
Surface Soil								
MPT-11-SS01[a]	11S00101	11/14/95			✔			
MPT-11-SS02[a]	11S00201	11/14/95			✔			
MPT-11-SS02[a]	11S00201D	11/14/95			✔			
MPT-11-SS03[a]	11S00301	11/14/95			✔			
Groundwater								
MPT-11-MW01S	11MW001S	7/7/94	✔	✔	✔	✔	✔	✔
MPT-11-MW02S	11MW002S	7/6/94	✔	✔	✔	✔	✔	✔
MPT-11-MW03S	11MW003S	7/6/94	✔	✔	✔	✔	✔	✔

Notes:

[a] – collected as part of the CCED.
✔ - indicates that the sample was analyzed for the group of chemicals.
"D" at end of sample ID indicates duplicate sample.

P:\GIS\MAYPORT\SWMU12-17_CMS3.APR\FIG 2-2_SAMPLE LOCATION MAP, SWMU 12 JCB 3/27/01



Surface and subsurface soil samples were not collected at SWMU 12 during RFI investigations because it was believed that there was no process or mechanism that would have caused a release to those media. (Note: Soil samples were collected after the RFI was completed. See Section 2.1.1.5.) Furthermore, a previous investigation conducted in 1989 for a closure plan showed that soil samples collected beneath the basin (using angled drilling) did not contain detectable concentrations of Appendix IX inorganics and the soil pH ranged from 8.18 to 9.16 standard units (SUs).

2.1.1.2 RFI Findings

Organic compounds detected in groundwater samples consist of four VOCs and two SVOCs. Chlorinated solvents detected in groundwater samples collected from monitoring well MPT-11-MW03S during the 1994 sampling event were 1,1-dichloroethane, 1,2-dichloroethene, and methylene chloride; none of these contaminants exceeded the benchmark values used in the RFI. 1,2-Dichlorobenzene and 4-nitrophenol were detected in groundwater samples collected from monitoring wells MPT-11-MW02S and MPT-11-MW03S in 1994 at concentrations below benchmark values. Phenol was detected in groundwater samples collected in 1993 and 1994 from monitoring well MPT-11-MW02S. The concentrations of phenol detected in 1994 exceeded the benchmark value.

It was concluded in the RFI that the organic compounds detected in groundwater samples were not consistent with the use of the Neutralization Basin and that it was unlikely that the contaminants detected in groundwater were related to SWMU 12. However, the source of the organic constituents was not known.

Sixteen inorganic analytes were detected in groundwater samples collected during the RFI. Five of the analytes, arsenic, iron, manganese, sodium, and vanadium, were detected in groundwater samples at concentrations greater than benchmark values used in the RFI.

Sodium Hydroxide Spill

The spill of sodium hydroxide occurred near the Neutralization Basin, and, based on the direction of groundwater flow toward the St. Johns River, the spill was upgradient of monitoring well MPT-11-MW02S. The groundwater samples from monitoring well MPT-11-MW02S contained the highest detected concentrations of inorganic analytes including arsenic, copper, lead, nickel, sodium, and vanadium. The analyses of filtered groundwater samples suggested that the inorganics are dissolved in groundwater. Values of pH measured in groundwater samples collected in 1993 and 1994 from monitoring well MPT-11-MW02S were 10 (field measured) and 11.4 SUs (laboratory result). These values exceeded the FDEP guidance concentration of 8.5 SUs for groundwater. The pH measurement taken at well MPT-11-MW02S before the 1992 release of sodium hydroxide was approximately 7 SUs.

The concentration of sodium detected in groundwater in MPT-11-MW02S is several times higher than the concentration of sodium detected in MPT-11-MW03S, which is about the same distance from the river. Concentrations of calcium and magnesium detected in groundwater in MPT-11-MW02S are at least two orders of magnitude lower than concentrations detected in MPT-11-MW03S.

According to the RFI, the above summary was the basis for suggesting that the sodium hydroxide spill has affected the groundwater chemistry at MPT-11-MW02S. It is likely that the release of sodium hydroxide has caused the naturally present inorganics in the soil to be released to the groundwater upgradient of monitoring well MPT-11-MW02S.

2.1.1.3 RFI Assessment of Human Health Impacts

Risk characterization for SWMU 12 was conducted for potential exposures to groundwater under current and future land-use scenarios. The groundwater samples were collected from the Surficial Aquifer using bailers in 1993 and using low flow sampling in 1994. The low flow sample method produces less turbid samples and is more representative of the Surficial Aquifer as compared to the samples collected by the bailer. Therefore, only the samples from the 1994 sampling were considered for risk evaluation. However, the contaminants detected in groundwater samples in the 1993 sampling event were included in the final data set if they were not detected in the 1994 sampling event.

Soil

Surface and subsurface soil samples were not collected for the Human Health Risk Assessment (HHRA) during the RFI because a release due to overtopping of the Neutralization Basin had not been reported and no impacts to soil were considered likely (see Section 2.1.1.5).

Groundwater

No exposure to groundwater in the Surficial Aquifer under the current industrial land use was stipulated in the RFI; therefore, only potential future land use was evaluated. The ELCR associated with ingestion of groundwater was 9×10^{-4} for the hypothetical adult resident; cancer risk associated with the inhalation of VOCs during showering was not evaluated because VOCs were not selected as COCs. Arsenic was the only contaminant contributing cancer risk to the ELCR for the hypothetical adult resident.

The HI for a hypothetical adult resident's ingestion of groundwater was 4. Arsenic (HQ = 3.9) was the major contributor to the HI followed by vanadium (HQ = 0.43). Noncarcinogenic risk to the adult resident associated with the inhalation of VOCs during showering was not evaluated because VOCs were not selected as COCs.

The RFI stated that although there would be unacceptable cancer or noncancer risks to human health under a hypothetical future residential scenario, there is no human exposure to groundwater under the current use of SWMU 12, and it is unlikely that there will be a residential exposure during future use. Therefore, remediation of the COCs in groundwater based on human health concerns was deemed unwarranted.

2.1.1.4 RFI Assessment of Ecological Impacts

The Ecological Risk Assessment (ERA) evaluated risks to aquatic life associated with exposure to groundwater as it discharges into the St. Johns River and concluded that the discharge is not expected to pose an unacceptable risk for aquatic receptors. The St. Johns River is located approximately 75 feet from SWMU 12. Aquatic receptors including invertebrates, plants, algae, amphibians, fish, and reptiles may be exposed to groundwater contamination as it discharges to the surface. Terrestrial receptors were not evaluated because the area is paved and without food or cover for habitat.

Analytes detected in groundwater were screened as ecological contaminants of potential concern (COPC-Es) by a comparison of the average detected concentration with RFI background concentration for inorganics, organic compounds, and FDEP F.A.C. 62-302 surface water quality standards for Class III marine waters. Eight of 21 analytes detected in groundwater were selected as COPC-Es including three VOCs (1,1-dichloroethane, 1,2-dichlorobenzene, and 1,2-dichloroethene), one SVOC (4-nitrophenol), and four inorganics (copper, lead, nickel, and vanadium).

The average and maximum detected concentrations are assumed to be the worst-case exposure point concentrations, assuming no dilution. Less conservative exposure point concentrations were also evaluated based on 10, 100, and 1,000 times dilution of the groundwater as it is discharged into the river.

Ecological effects were evaluated by comparing exposure point concentrations to regulatory criteria, RFI background screening values, and available aquatic toxicity benchmarks compiled from searches of the USEPA AQUIRE database. Assuming no dilution, the maximum and average exposure point concentrations (maximum/average) of only copper (19.7/13.6 μg/L), lead (5.7/3.4 μg/L), and nickel (20.4/20.4 μg/L) in groundwater exceeded regulatory surface water criteria. No toxicity benchmarks were available to evaluate toxic effects of copper, lead, and nickel. The RFI conclusion of no effects to aquatic receptors assumed groundwater is diluted by surface water by at least 10 times. It was noted in the RFI that surface water samples collected from the St. Johns River during the GIR investigation and during the RFI background study contained copper at concentrations exceeding regulatory criteria at locations north and northeast of SWMU 12.

2.1.1.5 RFI Recommendations

The RFI recommended no further action for SWMU 12. The RFI considered the sodium hydroxide release as an AOC unrelated to the operation of the Neutralization Basin at SWMU 12 and recommended conducting an assessment to determine the impacts from the spill. According to the RFI, subsurface soil samples should be collected to access whether the sodium hydroxide spill poses any adverse effects to human health and the environment. Because the area where the spill occurred was covered with clean soil and vegetation, the collection of surface soil samples was not recommended.

2.1.2 CCED

The goal of the CCED petition was to document that the operation of the Neutralization Basin did not result in a release of hazardous contaminants to the environment and to confirm that no remediation was necessary to clean close the Neutralization Basin. The draft RCRA CCED Petition presented the findings, conclusions, and recommendations for clean closure of the Neutralization Basin.

Surface Soil Sampling and Analysis

Three surface soil samples were collected during the CCED in 1995 at SWMU 12 (Table 2-1). Two surface soil samples, MPT-11-SS02 and MPT-11-SS03, were collected on November 14, 1995, near the eastern and northern perimeters of the Neutralization Basin. A background sample, MPT-11-SS01, was collected south of Building 1241. Samples were not specifically collected at the sodium hydroxide spill area because it had been covered with clean soil. Surface soil samples were collected from 0 to 1 foot bgs and analyzed for Appendix IX metals, cyanide, and pH.

Inorganic analytes detected in the surface soil samples consisted of arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, zinc, and cyanide. None of the analytes were detected at concentrations greater than their respective background screening values referenced in the CCED document. However, cobalt and mercury were detected in the samples collected adjacent to the Neutralization Basin but not in the background sample, and nickel was detected only in the background sample. Only arsenic was detected at a concentration that slightly exceeded the residential soil cleanup goal. However, the concentration of arsenic did not exceed the industrial cleanup goal.

The pH of the soil samples ranged from 8.45 to 8.82 SUs and averaged 8.54 SUs. According to the CCED, the pH values in the soil appeared to be within the range that would be neutral for soil containing calcareous materials.

An estimate was presented for the human health risk for residential and industrial exposures to arsenic at the maximum detected concentrations. It was estimated that arsenic in surface soil resulted in an ELCR of 1.6×10^{-6} for a residential receptor and 3.5×10^{-7} for an industrial receptor.

Aquifer Characterization

Aquifer characterization was conducted at the Neutralization Basin during the CCED to determine groundwater flow direction, groundwater flow rates, and the influence of the St. Johns River on the surficial water table. The aquifer investigation included:

- Measuring tidal fluctuations of the St. Johns River adjacent to the Neutralization Basin.
- Measuring the response of the Surficial Aquifer relative to tidal fluctuations of the St. Johns River and the local rainfall.
- Measuring specific conductivity of groundwater in monitoring wells at SWMU 12.

The results of the aquifer characterization at the Neutralization Basin are presented in the CCED (HLA, 1998). In summary, the aquifer water levels in wells MPT-11-MW02S and -MW03S reflected tidal elevation stages in the St. Johns River. The amplitude of the aquifer water level change appeared to be less than 1 foot with a time lag of approximately 4 to 6 hours. Changes at well MPT-11-MW01S, located further away from the shoreline, were more muted, indicating a diminished effect with increasing distance from the river. A reversal in the groundwater flow direction of the water table zone of the Surficial Aquifer did not appear to occur. Conductivity measured in the three monitoring wells over time showed that conductivity was generally 3 to 10 times higher in wells MPT-11-MW02S and -MW03S that are closer to the shoreline than in well -MW01S. Furthermore, the fluctuations in conductivity appeared to be correlated to semidiurnal and lunar tidal cycles. This suggested that there would be considerable variation over short periods of time in water quality (i.e., fresh, estuarine, and marine) at wells MPT-11-MW02S and -MW03S. The potentiometric surface data collected between February 1994 and May 1995 showed a consistent flow direction toward the St. Johns River. However, some uncertainty in the exact water level elevation at wells MPT-11-MW02S and -MW03S was attributed to the tidal influence on these wells.

Ecological Assessment

Exposure of terrestrial receptors was not evaluated in the CCED ERA because the area use was industrial and the site was paved with concrete. Exposure of aquatic receptors in the benthic zone of the St. Johns River was evaluated in the CCED ERA to groundwater discharging to surface water. Only unfiltered samples were considered and the same eight analytes were selected as COPC-Es as in the RFI ERA (1,1-dichloroethane, 1,2-dichlorobenzene, 1,2-dichloroethene, 4-nitrophenol, copper, lead, nickel, and vanadium). The COPC-Es copper, lead, and nickel detected in groundwater samples exceeded toxicity benchmark values. Copper was also detected in the St. Johns River unaffected by SWMU 12 at concentrations higher than the benchmarks. Risk for aquatic receptors was not expected because unfiltered samples include both the biologically available dissolved fraction and the unavailable nondissolved phases of the metal. It was assumed that the fraction of metals biologically available and potentially toxic to aquatic receptors were likely to be considerably less than the total concentrations measured.

Conclusions

Based on the findings, the CCED petition for the Neutralization Basin supported a clean closure under 40 CFR 270.1(c) because there was no evidence that a release of hazardous contaminants from the Neutralization Basin to the environment had occurred. According to the CCED, the release of sodium hydroxide was designated an AOC that was to be further investigated under NAVSTA Mayport's RCRA Corrective Action Program.

2.1.3 CMS Data Set

The results of environmental samples collected during the RFI and the CCED investigations conducted in 1993, 1994, and 1995 were used to evaluate COPCs and to select COCs in this CMS. Table 2-1 provides a list of all samples for each medium that was used in the CMS. Tables listing the complete analytical results of all sampling events per medium are included in Appendix A.

As a result of FDEP comments on the draft CMS (TtNUS, 2000), two complete rounds of groundwater samples were collected at SWMU 12 from all existing and functional monitoring wells during August 2001 and July 2002 and analyzed for the COCs determined in the Draft CMS: copper, iron, manganese, nickel, phenol, pH, and vanadium. A comparison of the post-draft CMS groundwater data with the draft CMS data set is shown in Table 2-2. The results for the new groundwater samples show that the concentrations of these contaminants have significantly reduced. The new groundwater analytical results are included in Appendix A.

TABLE 2-2
SWMU 12, POST-DRAFT CMS GROUNDWATER SAMPLING RESULTS
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FREQUENCY OF DETECTION	DRAFT CMS MAXIMUM CONCENTRATION (µg/L)	AUGUST 2001 CONCENTRATION (µg/L)	NOVEMBER 2002 CONCENTRATION (µg/L)	VALUE USED IN THE FINAL CMS (µg/L)
Copper	7440-50-8	2/3	19.7	16.4	2.2	2.2
Iron	7439-89-6	2/3	915	756	444	444
Nickel	7440-02-0	1/3	20.4	6.63	ND	ND
Vanadium	7440-62-2	2/3	110	62	14.6	14.6
Phenol	108-95-2	1/3	43	--	ND	ND
pH		3/3	11.4	7.78	7.7	7.7

ND – Not Detected

2.2 CONTAMINANTS OF CONCERN – HUMAN HEALTH

The determination of COCs for each medium involves a three-step process as described in Section 1.4.3:

1. Determine the COIs.
2. Identify the COPCs.
3. Select the COCs.

COIs and COPCs were determined only for groundwater in the RFI; however, since the RFI was issued additional soil and groundwater data have been collected and new regulations have been promulgated. Therefore, the COIs and COPCs are reevaluated in the following sections to select the COCs to be carried forward in the CMS remedy selection process.

2.2.1 Contaminants of Interest – Human Health

The COIs included any contaminant detected at least once in validated analytical results for environmental samples in any medium at the site during any sampling event. The original list of COIs was provided in the RFI and CCED Reports. The revised list of COIs by media is provided in Table 2-3.

TABLE 2-3

SWMU 12, CONTAMINANTS OF INTEREST IN SOIL AND GROUNDWATER
NAVSTA MAYPORT, FLORIDA

LIST OF COIs	SOIL	GROUNDWATER
Volatile Organics		
1,1-Dichloroethane		X
1,2-Dichlorobenzene		X
1,2-Dichloroethene (total)		X
Methylene Chloride		X
Semivolatile Organics		
4-Nitrophenol		X
Phenol		X
Inorganics		
Arsenic	X	X
Barium	X	X
Beryllium	X	
Cadmium	X	
Calcium		X
Chromium	X	X
Cobalt	X	
Copper	X	X
Cyanide	X	X
Iron		X
Lead	X	X
Magnesium		X
Manganese		X
Mercury	X	X
Nickel	X	X
Sodium		X
Vanadium	X	X
Zinc	X	X
Miscellaneous Parameters		
Ammonia, As Nitrogen		X
Chloride		X
Sulfate		X
Total Dissolved Solids		X
Petroleum Hydrocarbons		
Oil & Grease		X

2.2.2 Contaminants of Potential Concern – Human Health

The maximum concentration of the COIs for each environmental medium was compared to the Florida CTLs (Chapter 62-777, F.A.C.) for surface soil, subsurface soil, groundwater, sediment, and surface water, as appropriate. Section 1.4.3.2 provides a detailed description of the process for the identification of COPCs.

Calcium, magnesium, potassium, and sodium are considered to be essential human nutrients and were not considered in the COPC selection process. In addition, several water quality parameters that were measured during the groundwater analyses were not evaluated, including alkalinity, hardness, sulfide, TDS, TKN, TOC, and total phosphorus.

2.2.2.1 Selection of Surface Soil COPCs – Human Health

The COPC screening evaluation for soil involves an evaluation of COIs for direct exposure and leaching to groundwater. The direct exposure evaluation involves an adjustment of the CTLs (Chapter 62-777, F.A.C.) to account for the number of carcinogens and the number of noncarcinogens affecting the same target organ/system. For example, as shown in Table 2-4, because 4 contaminants were present in surface soil that were carcinogens, the industrial direct exposure SCTLs for these contaminants were divided by 4 to achieve the initial target criteria. Less than 20 surface soil samples were collected at SWMU 12; therefore, none of the COIs were eliminated based on frequency of detection. The initial direct exposure COPC screening process for surface soil identified one contaminant, arsenic, that exceeded the adjusted SCTLs (initial target criteria).

The final surface soil COPC selection was performed using adjusted SCTLs. Table 2-5 presents the comparison of maximum concentration with the adjusted SCTLs and lists no contaminants as a final Direct Exposure COPC.

Because surface water (i.e., St. Johns River) is located adjacent to SWMU 12, leaching of soil to marine surface water was also evaluated. The leaching to groundwater evaluation involves a direct comparison to the leaching to groundwater CTLs. Table 2-6 shows the leaching to groundwater evaluation. The leaching to groundwater evaluation determined that one contaminant, mercury, has the potential to leach from the soil and impact groundwater/surface water. Therefore, one contaminant was selected as a COPC for surface soil.

TABLE 2-4
SWMU 12, SURFACE SOIL INITIAL COPCs - INDUSTRIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL INDUSTRIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR [2]	INITIAL TARGET CRITERIA [3] (mg/kg)	EXCEEDS INITIAL TARGET LEVELS[4]
Inorganics								
Arsenic	7440-38-2	3/3	1.3	3.7	Carcinogen -Cardiovascular -Skin	4	0.9	Yes
Barium	7440-39-3	3/3	8	87,000	Cardiovascular	3	29,000	No
Beryllium	7440-41-7	3/3	0.08	800	Carcinogen -Gastrointestinal -Respiratory	4	200	No
Cadmium	7440-43-9	2/3	1.2	1,300	Carcinogen -Kidney	4	325	No
Chromium[5]	7440-47-3	3/3	3.4	420	Carcinogen -Respiratory	4	105	No
Cobalt	7440-48-4	1/3	0.65	110,000	Cardiovascular -Immunological -Neurological-Reproductive	4	27,500	No
Copper	7440-50-8	3/3	3.8	73,000	None Specified	1	73,000	No
Cyanide	57-12-5	2/3	0.17	39,000	Body Weight -Neurological -Thyroid	4	9,750	No
Lead	7439-92-1	3/3	14	920	Neurological	4	230	No
Mercury	7439-97-6	1/3	0.05	26	Neurological	4	6.5	No
Nickel	7440-02-0	1/3	2.6	28,000	Body Weight	2	14,000	No
Vanadium	7440-62-2	3/3	10.3	7,400	None Specified	1	7,400	No
Zinc	7440-66-6	3/3	23.3	560,000	Blood	1	560,000	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Industrial - Chapter 62-777 F.A.C., May 1999
2 - Adjusted Divisor is determined by the number of carcinogens or chemicals that affect the same target organ.
3 - The SCTL for direct exposure to soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative effects.
4 - Comparison of the Initial Target Criteria with the Maximum Concentration.
5 - SCTL Industrial screening values used for Chromium (Hexavalent)

TABLE 2-5
SWMU 12, SURFACE SOIL FINAL COPCs - INDUSTRIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

INITIAL COPC	CAS NUMBER	MAXIMUM CONCENTRATION (mg/kg)	SCTL INDUSTRIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[2]			ADJUSTMENT DIVISOR[3]	DIRECT EXPOSURE TARGET CRITERIA[4] (mg/kg)	COPC BASED ON INDUSTRIAL DIRECT EXPOSURE[5] (Yes/No)
					Carcinogen	Cardiovascular	Skin			
Arsenic	7440-38-2	1.3	3.7	Carcinogen - Cardiovascular -Skin	0.351	0.351	0.351	1	3.7	No
				Cumulative Sum	0.351	0.351	0.351			

Notes:
1 - SCTL - Soil Cleanup Target Level for Industrial - Chapter 62-777 F.A.C., May 1999
2 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
3 - Adjusted Divisor is determined by the number of carcinogens or chemicals that affect the same target organ. If the Cumulative Sum is less than 1, then the Adjustment Divisor is equal to 1.
4 - The SCTL for direct exposure with soil in an industrial setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative effects.
5 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the COPC target criteria.

TABLE 2-6
SWMU 12, SURFACE SOIL COPCS - LEACHING
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL LEACHING TO GROUNDWATER [1] (mg/kg)	SCTL LEACHING TO SURFACE WATER [2] (mg/kg)	LEACHING TARGET CRITERIA [3] (mg/kg)	COPC BASED ON LEACHING[4] (Yes/No)
Inorganics							
Arsenic	7440-38-2	3/3	1.3	29	No Criteria	29	No
Barium	7440-39-3	3/3	8	1,600	No Criteria	1,600	No
Beryllium	7440-41-7	3/3	0.08	63	No Criteria	63	No
Cadmium	7440-43-9	2/3	1.2	8	No Criteria	8	No
Chromium[5]	7440-47-3	3/3	3.4	38	No Criteria	38	No
Cobalt	7440-48-4	1/3	0.65	No Criteria	No Criteria	No Criteria	No
Copper	7440-50-8	3/3	3.8	No Criteria	No Criteria	No Criteria	No
Cyanide	57-12-5	2/3	0.17	40	No Criteria	40	No
Lead	7439-92-1	3/3	14	No Criteria	No Criteria	No Criteria	No
Mercury	7439-97-6	1/3	0.05	2.1	0.01	0.01	Yes
Nickel	7440-02-0	1/3	2.6	130	No Criteria	130	No
Vanadium	7440-62-2	3/3	10.3	980	No Criteria	980	No
Zinc	7440-66-6	3/3	23.3	6,000	No Criteria	6,000	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Soil leaching to groundwater - Chapter 62-777 F.A.C., May 1999
2 - SCTL - Soil Cleanup Target Level for Soil leaching to surface water - Chapter 62-777 F.A.C., May 1999
3 - Minimum SCTL based to soil leaching to groundwater and soil leaching to surface water (if applicable).
4 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the leaching target criteria.
5 - SCTL screening value used for Chromium (Hexavalent)

2.2.2.2 Selection of Groundwater COPCs – Human Health

The initial COPC screening process for groundwater begins with separating COIs that have a primary or secondary standard. COIs with a primary or secondary standard are compared directly to the GCTLs to determine initial COPCs. COIs without a primary or secondary standard are adjusted according to the number of carcinogens or the number of noncarcinogens affecting the same target organ/system. Because SWMU 12 is located less than 300 feet away from the nearest surface water body (the St. Johns River) the discharge of groundwater into surface water was evaluated as a pathway of concern. The initial COPC screening process identified five contaminants that exceeded the adjusted GCTLs (initial target levels) as shown in Table 2-7.

The final screening of groundwater COPCs was performed by comparing the maximum concentrations of only the COIs that failed the initial screening (i.e., “Yes” in last column of Table 2-7) against the minimum CTL, either the adjusted GCTL for groundwater CTLs. Table 2-8 presents the comparison of maximum detections of COIs with the minimum CTLs and lists the contaminants selected as final COPCs. Table 2-9 compares the maximum concentrations of the COIs to the CTLs for groundwater discharging to marine surface water. The combined list of groundwater COPCs shows 8 contaminants: chloride, iron, lead, manganese, mercury, sodium, sulfate, and total dissolved solids.

The relatively high concentrations of sodium, chloride, and sulfate (compared to the GCTLs) suggest seawater impacts on the Surficial Aquifer in the vicinity of the Neutralization Basin.

2.2.3 <u>Contaminants of Concern - Human Health</u>

The representative concentration of the COPCs for each environmental media was compared to the State CTLs (Chapter 62-777, F.A.C.) for surface soil, subsurface soil, and groundwater, as appropriate. Section 1.4.3.3 provides a detailed description of the process for the identification of COCs.

2.2.3.1 Selection of Surface Soil COCs – Human Health

Only three surface soil samples were collected at SWMU 12. Therefore, a 95 percent UCL was not calculated for mercury (the only final soil COPC, Table 2-6) and the maximum detected concentration of mercury, 0.05 mg/kg, was used as the site representative concentration. Mercury was detected only in the sample from location MPT-11-SS03. The MCS for mercury in surface soil was determined by the SCTL for soil leaching to marine surface water, 0.01 mg/kg, that was less than the direct contact and leaching to groundwater SCTLs, but greater than background (mercury was not detected in background surface soil). The maximum concentration of mercury did not exceed the soil direct contact or the leaching to groundwater SCTLs. Furthermore, the maximum

TABLE 2-7
SWMU 12, GROUNDWATER INITIAL COPCs - GCTLs
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/L)	GCTL[1] (mg/L)	TARGET CRITERIA[2] (P/S, HH)	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR[3]	INITIAL TARGET LEVEL[4] (mg/L)	EXCEEDS INITIAL TARGET LEVEL[5]
Constituents Without Primary or Secondary Standards									
Inorganics									
Vanadium	7440-62-2	2/3	14.6	49	HH	None Specified	1	49	No
Semivolatile Organics									
4-Nitrophenol	100-02-7	2/3	13	56	HH	None Specified	1	56	No
Phenol	108-95-2	1/3	ND	10	HH	Developmental	1	10	No
Volatile Organics									
1,1-Dichloroethane	75-34-3	1/3	1	70	HH	Kidney	1	70	No
1,2-Dichloroethene (Total)	540-59-0	1/3	2	63	HH	Blood - Liver	1	63	No
Miscellaneous Parameters									
Ammonia, As Nitrogen		3/3	2,200	2800	HH	Respiratory	1	2,800	No
Alkalinity As CaCo3		3/3	1,440,000	No Criteria	No Criteria		1	No Criteria	No
Hardness As CaCo3		3/3	353,000	No Criteria	No Criteria		1	No Criteria	No
pH		3/3	7.7	6.5-8.5	No Criteria		1	6.5-8.5	No
Sulfide	18496-25-8	1/3	2,000	No Criteria	No Criteria		1	No Criteria	No
Total Kjeldahl Nitrogen		3/3	4,700	No Criteria	No Criteria		1	No Criteria	No
Total Organic Carbon	7440-44-0	3/3	23,300	No Criteria	No Criteria		1	No Criteria	No
Total Phosphorus	7723-14-0	3/3	1,160	No Criteria	No Criteria		1	No Criteria	No
Oil & Grease		1/3	10,000	No Criteria	No Criteria		1	No Criteria	No
Constituents With Primary or Secondary Standards									
Inorganics									
Arsenic	7440-38-2	3/3	42.5	50	P/S		1	50	No
Barium	7440-39-3	2/3	5.6	2,000	P/S		1	2,000	No
Chromium	7440-47-3	1/3	5.1	100	P/S		1	100	No
Copper	7440-50-8	2/3	2.2	1,000	P/S		1	1,000	No
Cyanide	57-12-5	2/3	0.94	200	P/S		1	200	No
Iron	7439-89-6	2/3	444	300	P/S		1	300	Yes
Lead	7439-92-1	2/3	5.7	15	P/S		1	15	No
Manganese	7439-96-5	2/3	87.2	50	P/S		1	50	Yes
Mercury	7439-97-6	1/3	0.12	2	P/S		1	2	No
Nickel	7440-02-0	1/3	ND	100	P/S		1	100	No
Sodium	7440-23-5	3/3	831,000	160,000	P/S		1	160,000	Yes
Zinc	7440-66-6	1/3	14.1	5,000	P/S		1	5,000	No
Semivolatile Organics									
1,2-Dichlorobenzene	95-50-1	2/3	2	600	P/S		1	600	No
Volatile Organics									
Methylene Chloride	75-09-2	1/3	1	5	P/S		1	5	No
Miscellaneous Parameters									
Chloride	16887-00-6	3/3	1,190,000	250,000	P/S		1	250,000	Yes
Sulfate	14808-79-8	3/3	105,000	250,000	P/S		1	250,000	No
Total Dissolved Solids		3/3	2,550,000	500,000	P/S		1	500,000	Yes

Notes:
1 - GCTL - Groundwater Cleanup Target Levels - Chapter 62-777 F.A.C. May 1999
2 - P/S - Primary Standard/Secondary Standard - F.A.C. 62-550 and Chapter 62-777, Table 1, dated May 1999. HH - Human Health Criteria.
3 - Adjustment Divisor is determined by the number of carcinogens or chemicals that affect the same target organ. Adjustment Divisor for Primary/Secondary Standard is 1.
4 - The GCTL from Chapter 62-777 F.A.C., Table 1, was divided by the number (i.e., adj. divisor) of carcinogenic COPCs or noncarcinogenic COPCs that affect the same target organ/system to account for cumulative effects.
5 - Comparison of the Initial Target Levels with the Maximum Concentration.

TABLE 2-8
SWMU 12, GROUNDWATER FINAL COPCs - GCTLs
NAVSTA MAYPORT, FLORIDA

INITIAL COPCs	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/L)	GCTL[1] (mg/L)	TARGET CRITERIA[2]	ADJUSTMENT DIVISOR[3]	FINAL TARGET LEVEL[4] (mg/L)	EXCEEDS FINAL TARGET LEVEL[5]
Constituents with Primary or Secondary Standards								
Inorganics								
Iron	7439-89-6	2/3	444	300	P/S	1	300	Yes
Manganese	7439-96-5	2/3	87	50	P/S	1	50	Yes
Miscellaneous Parameters								
Sodium	7440-23-5	3/3	831,000	160,000	P/S	1	160,000	Yes
Chloride	16887-00-6	3/3	1,190,000	250,000	P/S	1	250,000	Yes
Total Dissolved Solids		3/3	2,550,000	500,000	P/S	1	500,000	Yes

Notes:
1 - GCTL - Groundwater Cleanup Target Levels - Chapter 62-777 F.A.C. May 1999
2 - P/S - Primary Standard/Secondary Standard - F.A.C. 62-550 and Chapter 62-777, Table 1, dated May 1999. HH - Human Health Criteria.
3 - Adjustment Divisor is determined by the number of carcinogens or chemicals that affect the same target organ. Adjustment Divisor for Primary/Secondary Standard is 1.
4 - The GCTL from Chapter 62-777 F.A.C., Table 1, was divided by the number (i.e., adj. divisor) of carcinogenic COPCs or noncarcinogenic COPCs that affect the same target organ/system to account for cumulative effects.
5 - Comparison of the Initial Target Levels with the Maximum Concentration.

TABLE 2-9
SWMU 12, GROUNDWATER INITIAL COPCs - MARINE SURFACE WATER
NAVSTA MAYPORT, FLORIDA

Chemical of Interest	CAS NUMBER	FREQUENCY	MAXIMUM CONCENTRATION (μg/L)	MARINE SURFACE WATER CTL[1] (μg/L)	EXCEEDS MSW CTL[2]
Inorganics					
Arsenic	7440-38-2	3/3	42.5	50	No
Barium[3]	7440-39-3	2/3	5.6	41.58	No
Calcium	7440-70-2	3/3	173,000	Nutrient	No
Chromium	7440-47-3	1/3	5.1	-	No
Copper	7440-50-8	2/3	2.2	2.9	No
Cyanide	57-12-5	2/3	0.94	1	No
Iron	7439-89-6	2/3	444	300	Yes
Lead	7439-92-1	2/3	5.7	5.6	Yes
Magnesium	7439-95-4	3/3	30,700	Nutrient	No
Manganese	7439-96-5	2/3	87.2	-	No
Mercury	7439-97-6	1/3	0.12	0.012	Yes
Nickel	7440-02-0	1/3	ND	8.3	No
Sodium	7440-23-5	3/3	831,000	-	No
Vanadium	7440-62-2	2/3	110	-	No
Zinc	7440-66-6	1/3	14.1	86	No
Miscellaneous Parameters					
Alkalinity As CaCo3		3/3	1,440,000	-	No
Ammonia, As Nitrogen		3/3	2,200	-	No
Chloride[3]	16887-00-6	3/3	1,190,000	2,512	Yes
Hardness As CaCo3		3/3	353,000	-	No
Oil & Grease		1/3	10,000	-	No
pH		3/3	7.7	6.5-8.5	No
Sulfate[3]	14808-79-8	3/3	105,000	565	Yes
Sulfide	18496-25-8	1/3	2,000	-	No
Total Dissolved Solids		3/3	2,550,000	-	No
Total Kjeldahl Nitrogen		3/3	4,700	-	No
Total Organic Carbon	7440-44-0	3/3	23,300	-	No
Total Phosphorus	7723-14-0	3/3	1,160	-	No
Semivolatile Organics					
4-Nitrophenol	100-02-7	2/3	13	55	No
Phenol	108-95-2	1/3	ND	6.5	No
1,2-Dichlorobenzene	95-50-1	2/3	2	99	No
Volatile Organics					
1,1-Dichloroethane	75-34-3	1/3	1	-	No
1,2-Dichloroethene (total)	540-59-0	1/3	2	7,000	No
Methylene Chloride	75-09-2	1/3	1	1,580	No

Notes:
1 - Marine Surface Water CTL - Chapter 62-777 F.A.C. May 1999
2 - Comparison of the Marine Surface Water CTL with the Maximum Concentration.
3 - The MSW GCTL for barium, chloride, and sulfate is 10 % greater than NAVSTA Mayport background screening value for surface water as per Chapter 62-777 F.A.C. May 1999.

concentration of mercury detected in groundwater at SWMU 12 does not exceed the GCTL, indicating that mercury in the soil is not causing unacceptable human health risk for groundwater. As noted in F.A.C. Chapter 62-777, Table 1, the CTL for protection of marine surface water for mercury, from which the soil leaching to marine surface water SCTL is calculated, is based on ecological protection criteria contained in Chapter 62-302, F.A.C. This criterion of 0.01 mg/kg in soil is based on the protection of Class III marine surface water (applicable for the St. Johns River) for recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife. Therefore, the soil SCTL calculated from this criterion may have significant uncertainty for the protection of human health. (Note: The value for Class III marine surface water in F.A.C. Chapter 62-302 for mercury is listed as 0.025 µg/L, not 0.012 µg/L as listed in Table 1 of Chapter 62-777). Mercury was not selected as a COC for soil, considering the relatively low concentration detected in soil, its detection at only one of three sample locations, the lack of a known source or release mechanism at SWMU 12, and the low potential for unacceptable risk to human health in the industrial setting at SWMU 12. Although mercury was detected in groundwater at SWMU 12, it did not exceed the groundwater GCTL or the NAVSTA Mayport background screening value. Therefore, there are no soil COCs for SWMU 12.

2.2.3.2 Selection of Groundwater COCs – Human Health

Eight contaminants were identified as COPCs in groundwater at SWMU 12. Because less than ten groundwater samples were collected, a 95 percent UCL concentration was not calculated, and the maximum detected concentration of each COPC was used as the site representative concentration. Tables 2-10 and 2-11 show the evaluation of groundwater COCs for SWMU 12.

It was noted that the maximum concentration of lead detected in groundwater, 5.7 µg/L, was only marginally greater than the minimum CTL of 5.6 µg/L used to identify COPCs in Table 2-6. The minimum CTL was based on the protection of marine surface water for ecological receptors (F.A.C. 62-302) and may be inappropriate for protection of human health. Furthermore, the maximum concentration of lead does not exceed the GCTL for lead of 15 µg/L for groundwater used as a domestic water source. Therefore, lead was not considered for further evaluation as a COC in groundwater at SWMU 12.

The MCSs for three COPCs in groundwater, mercury, chloride, and sulfate, were determined by the CTL for protection of marine surface water that were less than the drinking water CTLs (Table 2-11). However, for mercury, chloride, and sulfate the MCSs were replaced by the Mayport background screening value (Tetra Tech NUS, 2000) that was greater than the marine surface water CTLs. It was also noted that the endpoints for which the CTLs for protection of surface water were calculated in Chapter 62-777, F.A.C. with the exception of chloride and sulfate, were based on ecological endpoints

TABLE 2-10
SWMU 12, SELECTION OF GROUNDWATER COCs
NAVSTA MAYPORT, FLORIDA

COPCs	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (μg/L)	REPRESENTATIVE CONCENTRATION[1] (μg/L)	GCTL[2] (μg/L)	TARGET CRITERIA[3]	BACKGROUND CONCENTRATION[4] (μg/L)	ADJUSTMENT DIVISOR[5]	SITE SPECIFIC CLEANUP STANDARD – GCTL[6] (μg/L)	COCs BASED ON GCTLs[7]
Constituents with Primary or Secondary Standards										
Inorganics										
Iron	7439-89-6	2/3	444	444	300	P/S	494	1	494	No
Manganese	7439-96-5	2/3	87.2	87	50	No Criteria	141	1	141	No
Sodium	7440-23-5	3/3	831,000	831,000	160,000	P/S	1,524,588	1	1,524,588	No
Miscellaneous Parameters										
Chloride	16887-00-6	3/3	1,190,000	1,190,000	250,000	P/S	2,284,000	1	2,284,000	No
Total Dissolved Solids		3/3	2,550,000	2,550,000	500,000	P/S	3,762,000	1	3,762,000	No

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - GCTL - Groundwater Cleanup Target Levels - Chapter 62-777 F.A.C. May 1999
3 - P/S - Primary Standard/Secondary Standard - F.A.C. 62-550 and Chapter 62-777, Table 1, dated May 1999.
4 - Mayport background screening value (Tetra Tech NUS, 2000).
5 - Adjustment Divisor is determined by the number of carcinogens or chemicals that affect the same target organ. Adjustment Divisor for Primary/Secondary Standard is 1.
6 - The Adjusted Media Cleanup Standard (MCS) is the GCTL or the background screening value, whichever is greater.
7 - A COPC is selected as a COC if the representative concentration exceeds the MCS.

TABLE 2-11
SWMU 12, GROUNDWATER COCs - MARINE SURFACE WATER
NAVSTA MAYPORT, FLORIDA

COPC	CAS NUMBER	FREQUENCY	MAXIMUM CONCENTRATION (μg/L)	REPRESENTATIVE CONCENTRATION (μg/L)	MARINE SURFACE WATER CTL[1] (μg/L)	BACKGROUND CONCENTRATION (μg/L)	SITE SPECIFIC CLEANUP STANDARD - LEACHING TO MARINE SURFACE WATER (μg/L)	EXCEEDS TARGET LEVELS[2]
Inorganics								
Copper	7440-50-8	2/3	2.2	2.2	2.9	-	2.9	No
Iron	7439-89-6	2/3	444	444	300	494	494	No
Lead	7439-92-1	2/3	5.7	5.7	5.6	2	5.6	No[4]
Mercury	7439-97-6	1/3	0.12	0.12	0.012	0.16	0.16	No
Miscellaneous Parameters								
Chloride[3]	16887-00-6	3/3	1,190,000	1,190,000	2512	2,284,000	2,284,000	No
pH		3/3	7.7	7.7	6.5-8.5	-	6.5-8.5	No
Sulfate[3]	14808-79-8	3/3	105,000	105,000	565	514,000	514,000	No

Notes:
1 - Marine Surface Water CTL - Chapter 62-777 F.A.C. May 1999
2 - Comparison of the Marine Surface Water CTL with the Maximum Concentration.
3 - The MSW GCTL for chloride and sulfate is 10 % greater than NAVSTA Mayport background screening value for surface water as per Chapter 62-777 F.A.C. May 1999.

(F.A.C. 62-302 or chronic toxicity to wildlife); therefore, the MCS based on protection of marine surface water for these COPCs may be highly conservative for human receptors (i.e., humans eating fish). For all remaining COPCs the MCSs were controlled by the GCTLs. However, the MSCs for iron, manganese, sodium, and total dissolved solids were replaced by the Mayport background screening value that was greater than the GCTLs for these COPCs.

As shown in Table 2-11, the representative concentrations of COPCs in groundwater did not exceed the MCSs and, therefore, no contaminants were selected as COCs.

2.3 CONTAMINANTS OF CONCERN – ECOLOGICAL

Exposure of terrestrial receptors was not evaluated in the RFI or CCED ERA because the area use is industrial and the site is mostly covered by structures or paved. In the RFI, a conclusion of no effects to aquatic receptors assumed groundwater discharge is diluted by surface water by at least 10 times. In the CCED, it was assumed that the fraction of metals in groundwater that would be biologically available and potentially toxic to aquatic receptors is likely to be considerably less than the total concentrations measured. Therefore, no potential risk to ecological receptors was identified in this CMS.

2.3.1 <u>COC Summary</u>

Since no COCs were identified in the surface soil or groundwater, the contaminants were not selected as COCs for further evaluation in the CMS.

2.4 VOLUMES OF CONTAMINATED MEDIA

Estimates of contaminated media volumes are made by identifying the areas exceeding the MCS. Soil analysis data were compared with the corresponding MCS only. (Ecological risks were not evaluated in the RFI because there were no terrestrial receptors due to the presence of concrete cover and there had not been a reported release due to overtopping of the Neutralization Basin.) No COCs were identified for surface soil or groundwater at SWMU 12; therefore, contamination maps were not prepared.

2.5 IDENTIFICATION AND SCREENING OF CORRECTIVE MEASURES TECHNOLOGIES

Corrective measure technologies are identified and screened to address the CAOs identified for SWMU 12. Because no soil contamination was found to exceed industrial MCSs, technologies are evaluated to ensure that the SWMU remains industrial. Each technology is then screened based on site and COC characteristics. Table 2-12 presents the soil corrective measure technologies that are potentially applicable for addressing the soil CAOs. This table also presents the results of the screening of those technologies. Because there was no soil contamination exceeding industrial standards at SWMU 12, technologies involving treatment or removal were not considered. The technology screening process reduces the number of potentially applicable technologies by evaluating the applicability of each technology to site and contaminant factors. Technologies deemed ineffective or not implementable were eliminated from further consideration.

For groundwater, no COCs were identified that exceed any MCSs; therefore, no corrective measure is necessary and no technologies/alternatives are required.

2.6 DEVELOPMENT OF CORRECTIVE MEASURES ALTERNATIVES

The technologies that passed the preliminary screening are selected to represent a typical general corrective action and are assembled into alternatives representing a range of treatment and containment combinations, as appropriate. The purpose of providing a range of alternatives is to ensure all reasonable general corrective actions are represented and evaluated. The technologies that are selected to represent various alternatives for soil are presented in Table 2-13. The assembly of these technologies into alternatives for soil is presented in Table 2-14.

2.7 EVALUATION OF CORRECTIVE MEASURE ALTERNATIVES

The identified corrective measures alternatives are evaluated using the criteria contained in the RCRA Corrective Action Plan, Final (USEPA, 1994).

The alternatives are evaluated against the standards listed below.

1. Protect human health and the environment.
2. Attain MCSs set by the implementing agency.
3. Control the source of releases so as to reduce or eliminate, to the extent practicable, further releases that may pose a threat to human health and the environment.
4. Comply with any applicable standards for management of wastes.
5. Other factors.

TABLE 2-12
SWMU 12, PRELIMINARY SCREENING OF CORRECTIVE MEASURES TECHNOLOGIES FOR SOIL
NAVSTA MAYPORT, FLORIDA

GENERAL CORRECTIVE ACTION	CORRECTIVE MEASURES TECHNOLOGY	TECHNOLOGY	DESCRIPTION	GENERAL SCREENING COMMENTS
No Action	None	Not Applicable	No remedial actions taken.	Retained. Will be considered for baseline comparison and for areas that have not experienced any releases of hazardous substances or for areas determined to have minimal short-term or long-term effects on soil, air, and groundwater quality.
Institutional Controls	Access Restrictions	Land Use Controls (LUCs)	LUCs for property in area would include restrictions on excavation/construction or future land and groundwater use.	Retained. LUCs are viable and will be considered where no active corrective measures are required and/or in combination with any technology where contaminants exceeding CMS objectives remain in place.
		Fencing	Construction of a fence to limit access to the site.	Retained. Will be applied to areas where special restrictions are required.
Monitoring	Monitoring	Monitoring	Monitoring the effectiveness of corrective action including downgradient groundwater monitoring.	Retained

TABLE 2-13
SWMU 12, REPRESENTATIVE SOIL CORRECTIVE MEASURE TECHNOLOGIES
NAVSTA MAYPORT, FLORIDA

General Corrective Action	Corrective Measures Technology	Technology	Representative Technology	Rationale
No Action	None	None	None	Required
Institutional Controls	Access Restrictions	LUCs	LUCs	LUCs offer broader controls.
Monitoring	Monitoring	Monitoring	Monitoring	Required

TABLE 2-14
SWMU 12, ASSEMBLY OF SOIL ALTERNATIVES
NAVSTA MAYPORT, FLORIDA

Alternative	Alternative Type	Representative Process Options Combined Into Alternatives	Alternative Description
Alternative 1: No Action	No Action	None	• No action.
Alternative 2: Land Use Controls and Site Monitoring	Containment/Limited Action – No or Limited Treatment	LUCs and Monitoring	• LUCs • Posting of warning signs. • Five-year site reviews for 30 years. • LUC Monitoring (for 30 years).

The criteria and elements for the above standards to be used for the detailed analysis of alternatives are described below.

<u>Protect Human Health and the Environment</u>

Corrective action remedies must be protective of human health and the environment. Remedies may include those measures that are needed to be protective, but are not directly related to media cleanup, source control, or management of wastes. A discussion of what types of short-term remedies are appropriate for the site and how various corrective measure alternatives meet this standard should be presented.

<u>Attain Media Cleanup Standards Set by the Implementing Agency</u>

Remedies will be required to attain MCSs set by the implementing agency that may be derived from existing State or Federal regulations or other standards. Provide the necessary information to address whether the potential remedy will achieve the preliminary remediation objective as defined by the implementing agency as well as other, alternative remediation objectives that may be proposed to attain the MCSs.

Control the Sources of Releases

A critical objective of any remedy must be to stop further environmental degradation by controlling or eliminating further releases that may pose a threat to human health and the environment. The source control standard is not intended to mandate a specific remedy or class of remedies. Instead, a wide range of options should be examined. This standard should not be interpreted to preclude the equal consideration of using other protective remedies to control the source, such as partial waste removal, capping, slurry walls, in situ treatment/stabilization or consolidation. As part of the CMS Report, the issue of whether source control measures are necessary should be addressed, and, if so, the type of actions that would be appropriate should be outlined. Any source control measure proposed should include a discussion on how well the method is anticipated to work given the particular situation at the facility and the known track record of the specific technology.

Comply with any Applicable Standards for Management of Wastes

A discussion of how the specific waste management activities will be conducted in compliance with all applicable Federal or State regulations [(e.g., closure requirements and land disposal restrictions (LDRs)] should be presented.

Other Factors

Five general factors represent a combination of technical measures and management controls for addressing the environmental problems at the facility. These factors will be considered as appropriate by the implementing agency in selecting/approving a remedy that meets the four standards listed above. The five general decision factors and relevant information that may be requested are as follows.

a. Long-Term Reliability and Effectiveness

Demonstrated and expected reliability is a way of assessing the risk and effect of failure. It may be considered whether the technology or a combination of technologies have been used effectively under analogous site conditions, whether failure of any one technology in the alternative would have an immediate impact on receptors, and whether the alternative would have the flexibility to deal with uncontrollable changes at the site (e.g., heavy rainstorms, earthquakes). Each corrective measure alternative should be evaluated in terms of the projected useful life of the overall alternative and of its component technologies.

b. Reduction in the Toxicity, Mobility, or Volume of Wastes

As a general goal, remedies will be preferred that are capable of eliminating or substantially reducing the inherent potential for the contaminants to cause future environmental releases or other risks to human health and the environment. However, there may be some situations where substantial reductions in toxicity, mobility, or volume may not be practicable or even desirable. Estimates of how much the corrective measure alternatives will reduce the waste toxicity, volume, and/or mobility may be helpful in applying this factor. This may be done through a comparison of initial site conditions to expected post-corrective measure conditions.

c. Short-Term Effectiveness

Short-term effectiveness may be particularly relevant when remedial alternatives will be conducted in densely populated areas, or where waste characteristics are such that risks to workers or to the environment are high and special protective measures are needed. Possible factors to consider include fire, explosion, exposure to hazardous substances, and potential threats associated with treatment, excavation, transportation, and redisposal or containment of waste material.

d. Implementability

Implementability will often be a determining variable in shaping remedies. Some technologies will require State or local approvals prior to construction and there may be some restrictions or concerns for some remedial approaches. Typical factors to be considered include administrative activities (e.g., permits, right of way, offsite approvals) and the time these activities will take; constructability of the remedial measure and time for beneficial results, availability of offsite treatment, storage, and disposal facility (TSDF) services; and availability of prospective technology.

e. Cost

The relative cost of a remedy may be an appropriate consideration, especially in those situations where several different technical alternatives to remediation will offer equivalent protection of human health and the environment. Cost estimates could include costs for engineering, site preparation, construction, materials, labor, sampling/analysis, waste management/disposal, permitting, health and safety measures, training, operation and maintenance (O&M), etc.

2.8 CORRECTIVE MEASURES ALTERNATIVES FOR SOIL

The corrective action for soil at SWMU 12 is to address the implementation of LUCs to restrict the future land use to industrial use. Two alternatives were developed to address soil contamination at SWMU 12.

The alternatives are as follows:

Soil Alternative 1: No Action

Soil Alternative 2: LUCs and Site Monitoring

2.8.1 Soil Alternative 1: No Action

The No Action alternative serves as a baseline consideration or addresses sites that do not require active remediation. This alternative assumes that no corrective action would occur. No LUCs would remain or be implemented. There would be no monitoring of conditions. Natural attenuation might eventually reduce low concentrations of contaminants to acceptable levels, but the progress of attenuation would not be monitored.

2.8.2 Soil Alternative 2: LUCs and Site Monitoring

Alternative 2 would be of the limited action type. LUCs are rules, directives, policies, and other measures (e.g., warning signs) adopted by the appropriate authorities in a manner consistent with applicable Federal, State, and local laws. Land use at SWMU 12 is to remain industrial. LUCs would be implemented in the form of a soil disturbance prohibition.

The implemented LUC would serve to both protect human health by precluding exposure to contamination and also serve to prevent contaminant migration to other areas of the base. LUCs are imposed on areas that exceed residential standards. Arsenic is the only contaminant that exceeds residential standards (see Appendix B). LUC implementation would occur via preparation of a site-specific Land Use Control Implementation Plan (LUCIP) which will describe the site location, the prohibition itself, its objectives, and other pertinent information. Once implemented, LUC oversight would be covered under the LUC Memorandum of Agreement (MOA) executed between FDEP, USEPA and NAVSTA Mayport which provides for certain periodic site inspection and reporting requirements.

Monitoring would consist of ensuring that LUCs remain in place and that the future use of the property remains industrial. Five-year site reviews would consist of evaluating the monitoring data for effectiveness of the corrective measure and LUCs.

2.9 EVALUATION OF SOIL CORRECTIVE MEASURE ALTERNATIVES

The identified Corrective Measures Alternatives for soil are evaluated using the criteria described in Section 2.7.

2.9.1 Soil Alternative 1: No Action

Protect Human Health and the Environment

No Action would allow unacceptable risks to human health (residential) and the environment. The No Action alternative would do nothing to effectively isolate future usage of the site.

Attain Media Cleanup Standards

No contaminants were present at levels higher than MCSs. No Action would not attain the residential MCSs in a reasonable period of time. Natural processes might eventually reduce low concentrations of contaminants to acceptable levels, but the progress of this attenuation would not be monitored.

Control the Source of Releases

No Action would not control or eliminate the potential source of contamination. Natural attenuation might eventually eliminate the source; however, the progress of attenuation would not be monitored.

Comply with any Applicable Standards for Management of Wastes

No Action would not involve any waste management activities and, therefore, no standards for management of wastes would apply.

Other Factors

a. Long-Term Reliability and Effectiveness

The No Action alternative would not provide long-term reliability and effectiveness at SWMU 12. Contaminants present in the soil might pose a long-term risk to human health (residential scenario) and the environment.

b. Reduction in the Toxicity, Mobility, or Volume of Wastes

Soil with contaminant concentrations above MCSs for residential scenario would remain onsite. No Action would allow unacceptable risks to human health and the environment. Reduction of toxicity, mobility, or volume might occur but only through natural processes.

c. Short-Term Effectiveness

The No Action alternative would not involve any construction or remedial implementation, so there would be no short-term risks to workers, the community, or the environment. Neither the public nor the workers would be exposed to potential threats associated with construction or transportation.

d. Implementability

No technical implementability issues would exist because no corrective action would occur. Once the alternative was approved, there would be no administrative issues and no need to coordinate with other agencies or acquire permits. Future remedial actions, if needed, would not be hindered by the No Action alternative.

e. Cost

No corrective action would occur; therefore, there would be no capital costs. The only cost associated with the No Action alternative is the cost for 5-year reviews since no remedial action will occur. The estimated present worth total project cost is $18,000 including $7,375 for 5-year reviews.

2.9.2 Soil Alternative 2: LUCs and Site Monitoring

Protect Human Health and the Environment

LUCs would effectively prevent direct human contact with contaminated soil by limiting activities at the site and restricting access to the site to industrial use. There were no soil with contaminant concentrations above MCS based on industrial scenario. LUCs would minimize direct human exposure to contaminated soil by controlling site access and use to industrial purpose. Monitoring of LUCs would make sure that LUCs are implemented to make the site available for industrial purposes only.

Attain Media Cleanup Standards

Contaminant concentrations were below the industrial MCSs. Natural attenuation might further reduce residual concentrations. The concentrations of contaminants in groundwater near the site were below the MCS.

Control the Source of Releases

The soil at SWMU 12 currently meets the State of Florida industrial standards and leaching to groundwater standards. Therefore, there is no source area to control above industrial standards. Monitoring of LUCs would make sure that LUCs are implemented to make the site available for industrial purposes only.

Comply with any Applicable Standards for Management of Wastes

LUCs would not involve any waste management activities and, therefore, no standards for management of wastes would apply.

Other Factors

a. Long-Term Reliability and Effectiveness

LUCs would provide long-term effectiveness or permanence at SWMU 12 by limiting the future use to industrial. COCs were not at concentration levels that they could continue to leach and migrate and might pose a long-term risk to human health and the environment. The concentration data indicate that contaminant concentrations in groundwater are either nondetect or below the corresponding GCTLs. LUCs would prevent exposure. Natural attenuation would offer reduction in risk over long periods of time. Long-term management would consist of LUCs and site monitoring and would be expected to last 30 years.

b. Reduction in the Toxicity, Mobility, or Volume of Wastes

Soil with residual contaminant concentrations (below MCSs) would remain onsite. LUCs would prevent unacceptable residential risks to human health and the environment. Reduction of toxicity, mobility, or volume of residuals might occur but only through natural processes.

c. Short-Term Effectiveness

The alternative would not involve any construction activity and there would be no short-term risks to workers, the community, or the environment. Implementation of this alternative would not pose any safety concerns to nearby communities, the environment, or onsite workers. Site activities would not cause fire or explosion.

d. Implementability

Alternative 2 would be readily implementable. This alternative should take less than 1 year to implement. Administrative issues and coordination with other agencies or acquiring permits are easily achievable. Future remedial actions, if needed, would not be hindered by this alternative.

e. Cost

The cost estimates reflect cost to the nearest $1,000. The estimated capital cost for Soil Alternative 2 would be $24,000. The annual O&M costs would be $3,700. Present worth cost over a period of 30 years would be $85,000. Groundwater monitoring costs are considered as part of the groundwater alternatives. Detailed cost estimates are provided in Appendix D.

2.10 RECOMMENDATION FOR A FINAL SOIL CORRECTIVE MEASURE ALTERNATIVE

The recommendation for a final soil corrective measure alternative will be based on a comparative analysis of soil alternatives.

2.10.1 Comparative Analysis of Soil Alternatives

A comparative analysis of Soil Alternatives is presented to address how effectively each alternative will comply with the standards listed in the guidance (USEPA, 1994). Alternative 1 (No Action) is considered for baseline purposes and is not expected to satisfy any of the requirements.

Protect Human Health and Environment

Alternative 2 would be effective in protecting human health and the environment. Alternative 1 would not protect human health or the environment.

Attain Media Cleanup Standards

Alternative 2 would meet the industrial MCSs. Alternative 1 would rely on natural processes to reduce the COC concentrations, but the progress would not be monitored.

Control the Sources of Releases

The soil at SWMU 12 currently meets the State of Florida industrial standards and leaching to groundwater standards. Therefore, there is no source area to control above industrial standards. Monitoring would make sure that LUCs are implemented to make the site available for industrial use.

Comply with any Applicable Standards for Management of Wastes

Alternatives 1 and 2 would not be involved in the generation of wastes and, therefore, no standards for management of wastes would apply.

Other Factors

a. Long-Term Reliability and Effectiveness

Alternative 1 would rely on natural attenuation processes in addressing the source. None of these alternatives would have any treatment system in-place. Alternative 1 would not provide any degree of long-term reliability.

b. Reduction in the Toxicity, Mobility, or Volume of Wastes

For both alternatives, soil with residual contaminant concentrations (below MCS) would remain onsite. Soil Alternative 2 would prevent unacceptable residential risks to human health and the environment. Reduction of toxicity, mobility, or volume of residuals might occur but only through natural processes.

c. Short-Term Effectiveness

Neither of these alternatives would pose any threat to local communities or onsite personnel during the implementation of the corrective measures. Onsite workers would be protected from exposure to hazardous substances through appropriate use of personal protective equipment (PPE).

d. Implementability

Both alternatives are readily implementable. Administrative issues and coordination with other agencies or acquiring permits are easily achievable. Future remedial actions would not be hindered by the alternative.

e. Cost

The estimated capital, O&M, and net present worth costs are presented in Table 2-15.

TABLE 2-15
SWMU 12, COSTS FOR SOIL ALTERNATIVES
NAVSTA MAYPORT, FLORIDA

ALTERNATIVE	CAPITAL COSTS	ANNUAL O&M COSTS	TOTAL PRESENT WORTH COSTS*
1	$0	• $7,375 every 5 years	$18,000
2	$24,000	• $3,731 for 1-30 years • with an additional $6,704 every 5 years	$85,000

Notes:
*30-YEAR, 7% INTEREST RATE

2.10.2 Recommendation

Based on the screening of technologies and assessment of various alternatives performed, Soil Alternative 2 is recommended for addressing the soil contamination at SWMU 12.

2.11 DESCRIPTION OF THE RECOMMENDED SOIL CORRECTIVE MEASURES ALTERNATIVE

2.11.1 Summary of the Soil Corrective Measure and Rationale

a. Description of the Corrective Measure and Rationale for Selection

The recommended corrective measure alternative involves contamination implementing LUCs at the site. There were no COCs for surface soil at SWMU 12. The current levels of contaminant concentrations were within the acceptable levels defined by FDEP. As the screening levels used for the assessment of soil conditions are based on industrial scenario, LUCs would be implemented. Monitoring of LUCs would make sure that LUCs are implemented to make the site available for industrial purposes only. Any groundwater concerns at the site will be addressed in the following sections. Alternative 2 would provide the required protection by implementing LUCs at the site. Without any COCs, LUCs would provide adequate and cost-effective protection of human health and the environment.

b. Performance Expectations

The recommended corrective measure alternative would prevent potential human exposure pathways. Based on the RFI conclusions, there were no ecological impacts.

c. Preliminary Design Criteria and Rationale

There are no design requirements.

d. General O&M Requirements

There are no O&M requirements.

e. Long-Term Monitoring Requirements

There are no monitoring requirements other than making sure that LUCs are in place.

2.11.2 Design and Implementation Precautions

a. Special Technical Problems

No technical problems are anticipated in implementing the corrective measures.

b. Additional Engineering Data Required

No additional engineering data are required.

c. Permits and Regulatory Requirements

Base permits would be needed for implementing LUCs.

d. Health and Safety Requirements

Occupational Safety and Health Administration (OSHA) requirements have to be satisfied during construction activities involving posting of signs, etc.

e. Community Relations Activities

The selection of preferred corrective measures and details on how they would be implemented will be presented to the local community.

2.11.3 Cost Estimate and Schedule

a. Capital Cost Estimate

The capital costs involved in the implementation of the recommended corrective measure alternative are presented in Table 2-15.

b. O&M Cost Estimate

O&M costs for the recommended corrective measure alternative are presented in Table 2-15.

c. Project Schedule

Figure 2-3 presents the project schedule for the implementation of the recommended corrective measure alternative.

2.12 CORRECTIVE MEASURES ALTERNATIVES FOR GROUNDWATER

No COCs were determined for groundwater at SWMU 12; therefore, no corrective action is required.

Figure 2-4 Soil Corrective Measure Implementation Schedule
SWMU No. 12, NAVSTA Mayport
Mayport, Florida

Figure 2-3 Soil Corrective Measure Implementation Schedule
SWMU 12, NAVSTA Mayport
Mayport, Florida

ID	Task Name	Duration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	Implement Landuse Controls	20 Days																															
2	Long-term Monitoring	30 Years																															

Project: SWMU No. 12 - Soil
Date: Thu 3/29/01

Task

Page 1

3.0 SWMU 17, CARBONACEOUS FUEL BOILER AREA

SWMU 17, the Carbonaceous Fuel Boiler (CFB), is located in the north-central part of NAVSTA Mayport (Figure 3-1). The CFB is located southwest of the Mayport Turning Basin, approximately 350 feet west of Echo Pier.

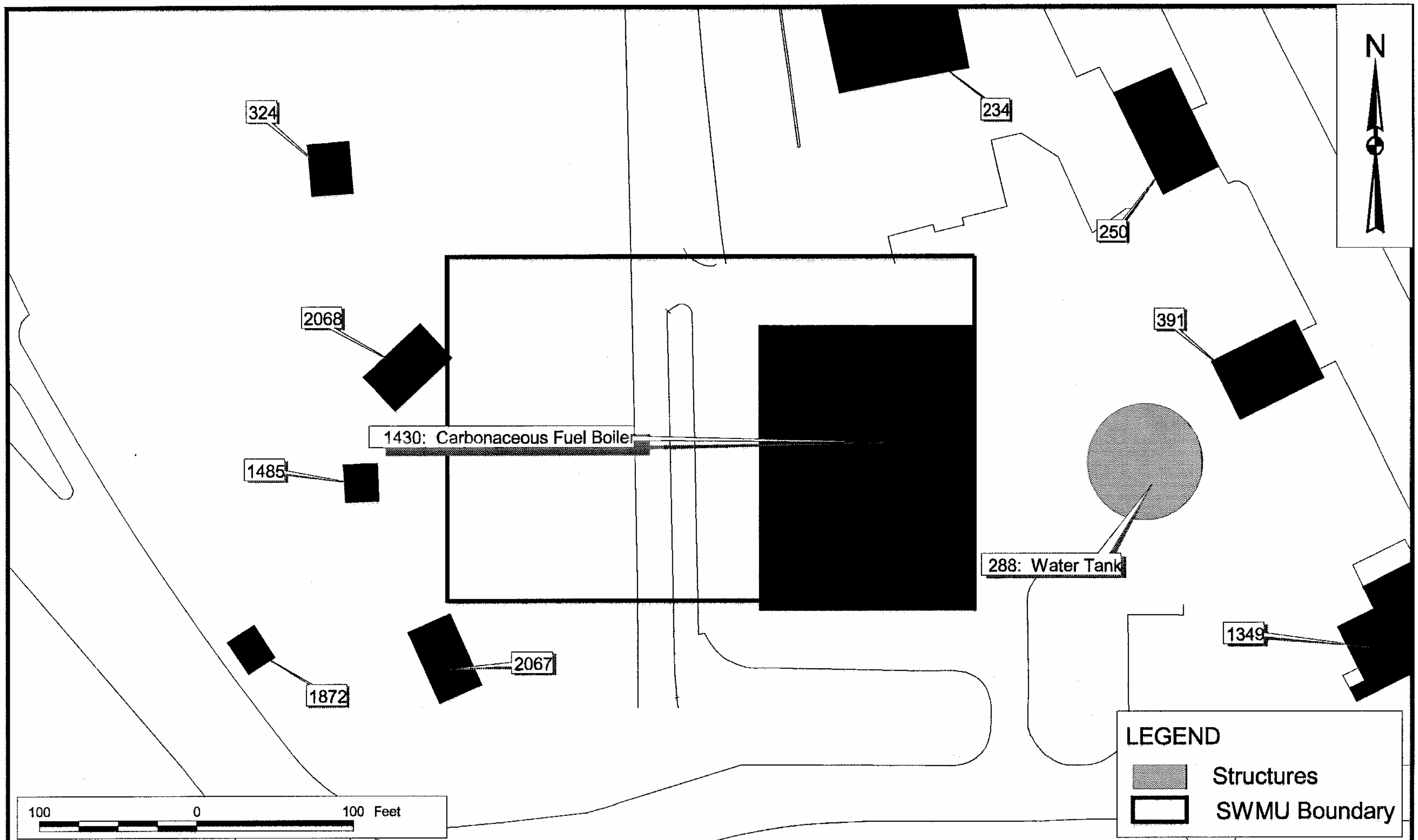
The CFB was a furnace fuelled by domestic solid waste from both the NAVSTA Mayport fleet and the housing area within the station. The CFB also burnt waste oil collected from various locations within the station as well as oil recovered from bilge water by the oily waste treatment plant. Waste oil and diesel fuel were stored at the CFB in two 6,000-gallon underground storage tanks (USTs) and two 550-gallon USTs, respectively. The CFB was operated 24 hours a day from 1979 to mid-1994, at which time it was taken out of service.

Boiler blowdown, tipping floor runoff, and quench water from the CFB were discharged into the sanitary sewer system. The boiler's air emission control system included a continuous blowdown for quenching ash and a fly-ash collector. Quenched ash (wet ash or bottom ash) was removed from the bottom of the furnace and placed in dumpsters. Fly ash (dry ash) was collected by a multi-cyclone separator and disposed of along with the quenched ash.

The RFA report identified the CFB as a SWMU because fly ash was being stored on the north side of the CFB building and a small amount of ash was noted to be piled on the asphalt near a roll-off container. Quenched ash when tested did not exceed the Federal regulatory criteria for hazardous waste using the extraction procedure (EP) toxicity test. However, the fly ash exceeded the Federal regulatory criteria for lead and cadmium using the EP toxicity test. From March through October 1995, an RFI was conducted to delineate the nature and extent of contamination. The activities conducted during the RFI are described in Section 3.1.

3.1 DESCRIPTION OF CURRENT CONDITIONS

The description of current conditions for SWMU 17 is based on descriptions and data presented in the RFI; no environmental programs have been conducted at the SWMU from the RFI to the preparation of the Draft CMS. The information from the RFI is summarized in the following sections; however, the reader is directed to the original RFI report (ABB-ES, 1996b) from which this information was obtained for further details and in-depth analyses of the data herein presented. The information and analytical data were utilized to form an understanding of the current conditions at SWMU 17 from which COCs were identified and for which remedial actions were recommended. The groundwater sampling that occurred after the preparation of the Draft CMS is discussed in Section 3.4.3.



DRAWN BY J. BELLONE	DATE 1/29/01	Tetra Tech NUS, Inc.	CONTRACT NUMBER N0455	OWNER NUMBER —
CHECKED BY —	DATE —	GENERAL LOCATION AND SITE FEATURES SWMU 17 - CARBONACEOUS FUEL BOILER NAVAL STATION MAYPORT MAYPORT, FLORIDA	APPROVED BY —	DATE —
COST/SCHEDULE-AREA			APPROVED BY —	DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 3-1	REV 0

P:\GIS\MAYPORT\SWMU12-17_CMS3.APR\FIG 3-1_GENERAL LOCATION AND SITE FEATURES, SWMU 17 JCB 3/27/01

Rev. 1
3/14/03

3.1.1 RCRA Facility Investigation

An RFI was conducted at SWMU 17 from March through October 1995 (ABB-ES, 1996b). The assessment included installation of groundwater monitoring wells and collection of surface and subsurface soil samples as well as groundwater samples. During the 1995 field effort, a total of 15 surface soil samples (depths of 0-1 foot bgs), along with 2 duplicate samples, and 3 subsurface soil samples (depths of 4-5 feet bgs), along with one duplicate sample, were collected and analyzed. Three monitoring wells (MPT-17-MW01S, MPT-17-MW02S, and MPT-17-MW03S) were installed in the shallow zone of the Surficial Aquifer during the RFI. A groundwater sample was collected from each of the three monitoring wells, and a duplicate sample was collected from well MPT-17-MW01S. The groundwater samples were collected using a low flow sampling method. Figure 3-2 depicts the various locations of soil samples and groundwater monitoring wells installed during the RFI.

Information regarding the investigation methods and sampling procedures are provided in the NAVSTA Mayport GIR (ABB-ES, 1995b), NAVSTA Mayport RFI Workplan (ABB-ES, 1991), and the RFI Workplan, Addendum 5 (ABB-ES, 1994).

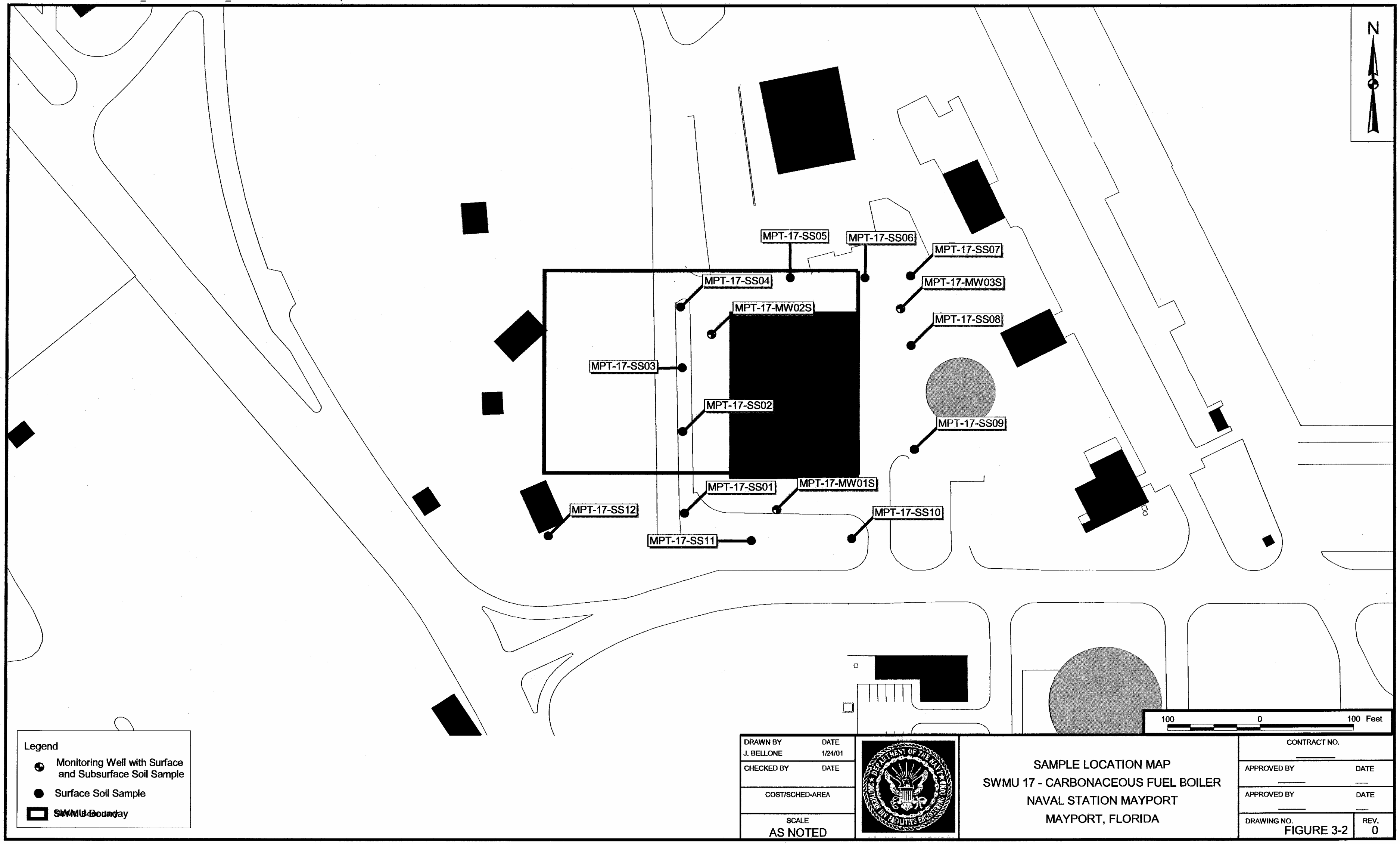
3.1.2 RFI Evaluation

Surface Soil

Four VOCs, 14 SVOCs, 6 pesticides, and 1 PCB were detected in the surface soil samples. Two SVOCs [benzo(a)pyrene and dibenzo(a,h)anthracene] were detected at concentrations that exceeded both the FDEP soil cleanup goals and the USEPA Region III risk-based concentrations (RBCs) for residential exposure used in the RFI. However, both contaminants were below the FDEP soil cleanup goals for industrial exposure.

Sixteen inorganic analytes were detected in surface soil samples. Arsenic and beryllium were detected at concentrations that exceeded FDEP and USEPA benchmarks used in the RFI for residential exposure. The RFI also stated that because the land features at SWMU 17 were influenced by the deposition of dredge material from the Mayport Turning Basin, it could not be determined if the concentrations of arsenic and beryllium in soil were related to releases at SWMU 17 or were residuals from the dredge material.

P:\GIS\MAYPORT\SWMU12-17_CMS3.APR\FIG 3-2_SAMPLE LOCATION MAP, SWMU 17 JCB 2/12/01



Subsurface Soil

Four VOCs, one SVOC, and four pesticides were detected in the subsurface soil samples. None of these compounds were detected at concentrations that exceeded the FDEP soil cleanup goal and the USEPA Region III RBCs for industrial exposure.

Ten inorganic analytes were detected in the subsurface soil samples. None of the organic compounds were detected at concentrations that exceeded the industrial soil exposures for either the FDEP soil cleanup goals or the USEPA Region III RBCs.

Groundwater

VOCs, pesticides, and PCBs were not detected in the groundwater samples collected at SWMU 17. The only organic compound detected in groundwater sample was bis(2-ethylhexyl)phthalate (BEHP). The concentration of BEHP exceeded the Florida groundwater guidance concentration and USEPA Region III RBC used in the RFI.

Ten inorganic analytes were detected in groundwater samples. Iron and manganese were detected at concentrations that exceeded background screening concentrations used in the RFI. Arsenic, iron, and manganese were detected at concentrations that exceeded the benchmarks used in the RFI.

Water quality parameters tested during the RFI showed that TDS were in the range acceptable for a drinking water aquifer, but marginally exceeded the secondary drinking water standard of 500 mg/L. Sulfate and chloride were also within acceptable drinking water concentrations. The range of hardness results indicated that the groundwater would be classified as very hard.

The RFI also stated that because the land features at SWMU 17 were influenced by the deposition of dredge material from the Mayport Turning Basin, it is possible that residual concentrations of inorganics from the dredge material have contributed to the inorganic concentrations detected in the groundwater samples.

3.1.3 RFI Assessment of Human Health Impacts

A risk assessment of the various contaminants detected in soil and groundwater samples collected at SWMU 17 was performed as part of the RFI Report (ABB-ES, 1996b). The exposure pathways evaluated for soil included inhalation, ingestion, dermal contact, and ingestion and inhalation of leached constituents (via groundwater). Receptors included future residents, current trespassers, and site workers (maintenance, occupational, and excavation). Exposure to groundwater was evaluated only for a hypothetical future adult resident for ingestion and inhalation of VOCs while showering. Both carcinogenic and noncarcinogenic risks were evaluated for each COPC for each completed pathway.

Soil

The ELCR for a hypothetical future land use for surface soil ingestion, dermal contact, and dust inhalation was 1×10^{-6} for the trespasser, 1×10^{-5} for the resident, 2×10^{-5} for the occupational worker, 6×10^{-7} for the site maintenance worker, and 6×10^{-8} for the excavation worker. The primary cancer risk for the resident was associated with benzo(a)pyrene, dibenz(a,h)anthracene, arsenic, and beryllium (3.9×10^{-6}, 2×10^{-6}, 3.1×10^{-6}, and 3.9×10^{-6}, respectively); each of these exceeded the FDEP's target risk level of 1.0×10^{-6} but did not exceed USEPA's acceptable risk range of 1.0×10^{-6}, to 1.0×10^{-4}. The noncancer risk associated with surface soil ingestion, dermal contact, and inhalation of dust for all future land use pathways were all below USEPA's and FDEP's target HI of 1.0. Risk for subsurface soil was not evaluated because human health COCs were not identified in the RFI.

Groundwater

Only ingestion of groundwater was evaluated in the RFI risk assessment because VOCs were not identified as human health COCs. Because there was no current use of groundwater, only future, hypothetical use by a resident was evaluated. The cancer risk associated with future ingestion of groundwater as drinking water was 1×10^{-6} for an adult resident. The cancer risk associated with BEHP, the only contributor to cancer risk, exceeded or equaled FDEP's target risk of 1.0×10^{-6}. The noncancer risk associated with groundwater ingestion was below FDEP's target HI of 1.0.

3.1.4 RFI Assessment of Ecological Impacts

Exposure to terrestrial receptors to potential contamination in surface soil was not evaluated in the RFI due to the lack of habitat (i.e., a majority of the site is paved with asphalt) and industrial land use. No pathway for ecological exposure to subsurface soil was identified. However, the RFI recognized that if the use of the site changes from industrial to residential, then the absence of the evaluation of exposure of terrestrial receptors to soil should be considered a data gap. The only pathway considered in the ERA was aquatic receptors in direct contact with groundwater as it discharges to surface water in the Mayport Turning Basin.

Three of 11 analytes detected in groundwater samples collected from the SWMU 17 monitoring wells were selected as COPC-Es. The three analytes included one SVOC (BEHP) and two inorganics (iron and manganese). Exposure of ecological receptors to the COPC-Es was bracketed by considering the maximum and average detected concentrations as the exposure point concentrations. These maximum and average exposure point concentrations were considered to represent the range of concentrations to which receptors would be exposed, assuming no reduction during groundwater transport to surface water or by dilution once the groundwater is discharged into surface water. The effects of the two sheet-piling walls around the perimeter of the Mayport Turning Basin were not considered in the ERA for groundwater.

With the exception of iron, maximum exposure point concentrations were less than the lowest toxicity benchmark concentrations for all COPC-Es in groundwater. The maximum and average exposure concentrations of iron in groundwater of 2,220 and 1,166 µg/L, respectively, exceeded both the Florida surface water quality standard of 300 µg/L and the lowest observed adverse effect level for dinoflagellate population growth of 100 µg/L. The RFI recognized that the maximum and average concentrations of iron from background monitoring wells used in the RFI (3,540 and 702 µg/L, respectively) also exceeded the toxicity benchmarks. Actual exposure concentrations were considered to probably be less than the maximum detected concentrations due to groundwater transport mechanisms such as dispersion, mixing, and retardation and because the analyses of total unfiltered samples used in the evaluation included both the biologically available dissolved fraction and any unavailable nondissolved phase present in the groundwater. Thus, the discharge of iron in groundwater to surface water was not expected to present a risk for aquatic receptors.

3.1.5 RFI Recommendations

The RFI recommendations for SWMU 17 were based on the current use of the site as an industrial area and the assumption that future use will not change. Additional investigation of surface soil, subsurface soil, or groundwater was not recommended under the current-use scenario of industrial land. It was recommended that SWMU 17 should be designated as an industrial area and the use of the Surficial Aquifer as a water supply should be prohibited.

3.1.6 CMS Data Set

The results of environmental samples collected during the RFI investigation conducted in 1995 were used to evaluate COPCs and to select COCs in this CMS. Table 3-1 provides a list of all samples, for each

TABLE 3-1

SWMU 17, SOIL AND GROUNDWATER SAMPLE IDENTIFICATION
NAVSTA MAYPORT, FLORIDA

Sample Location	Sample ID[a]	Sample Date	Volatile Organics	Semivolatile Organics	Inorganics	Pesticides	Total Petroleum Hydrocarbons	Water Quality
SURFACE SOIL								
MPT-17-SS01	17S00101	4/11/95	X	X	X	X		
MPT-17-SS01	17S00101D	4/11/95	X	X	X	X		
MPT-17-SS02	17S00201	4/11/95	X	X	X	X		
MPT-17-SS03	17S00301	4/11/95	X	X	X	X		
MPT-17-SS04	17S00401	4/11/95	X	X	X	X		
MPT-17-SS05	17S00501	5/24/95	X	X	X	X		
MPT-17-SS06	17S00601	5/24/95	X	X	X	X		
MPT-17-SS07	17S00701	4/11/95	X	X	X	X		
MPT-17-SS08	17S00801	4/11/95	X	X	X	X		
MPT-17-SS09	17S00901	4/11/95	X	X	X	X		
MPT-17-SS09	17S00901D	4/11/95	X	X	X	X		
MPT-17-SS10	17S01001	4/11/95	X	X	X	X		
MPT-17-SS11	17S01101	4/11/95	X	X	X	X		
MPT-17-SS12	17S01201	4/11/95	X	X	X	X		
MPT-17-MW01S	17S01301	5/23/95	X	X	X	X		
MPT-17-MW02S	17S01401	5/23/95	X	X	X	X		
MPT-17-MW03S	17S01501	5/24/95	X	X	X	X		
SUBSURFACE SOIL								
MPT-17-MW01S	17B01305	5/23/95	X	X	X	X		
MPT-17-MW02S	17B01405	5/23/95	X	X	X	X		
MPT-17-MW03S	17B01505	5/24/95	X	X	X	X		
MPT-17-MW03S	17B01505D	5/24/95	X	X	X	X		
GROUNDWATER								
MPT-17-MW01S	17G00101	6/18/95	X	X	X	X	X	X
MPT-17-MW01S	17G00101D	6/18/95	X	X	X	X		
MPT-17-MW02S	17G00201	6/18/95	X	X	X	X	X	X
MPT-17-MW03S	17G00301	6/18/95	X	X	X	X	X	X

[a] "D" at the end of the Sample ID indicates duplicate sample.

medium that was used in the CMS. Tables listing the complete analytical results of all sampling events per medium are included in Appendix A.

3.2 CONTAMINANTS OF CONCERN – HUMAN HEALTH

The determination of COCs for each medium involves a three-step process as described in Section 1.3:

1. Determine the COIs.
2. Identify the COPCs.
3. Select the COCs.

COIs and COPCs were determined for soil and groundwater in the RFI; however, since the RFI was issued new CTLs have been promulgated by the FDEP. Therefore, the COIs and COPCs are reevaluated in the following sections to select the COCs to be carried forward in the CMS remedy selection process.

3.2.1 Contaminants of Interest – Human Health

The COIs included any contaminant detected at least once in validated analytical results for environmental samples in any medium at the site during the RFI sampling events. The original list of COIs was provided in the RFI reports. The revised list of COIs by media is provided in Table 3-2.

3.2.2 Screening of Soil COPCs – Human Health

The initial COPC screening process identified six COIs in surface soil and no COIs in subsurface soil that exceeded the minimum SCTLs (either the adjusted SCTLs for industrial direct contact or the leaching to groundwater SCTL; see Section 1.3.3.2). Because the nearest receiving surface water body (i.e., Mayport Turning Basin) is located more than 300 feet away from SWMU 17, leaching of soil to marine surface water was not evaluated. Tables 3-3, 3-4, 3-5, and 3-6 present the initial screening process; list all contaminants detected in surface and subsurface soil, their maximum concentrations, the State of Florida SCTLs for industrial land use and for soil leaching to groundwater; and identify the initial COPCs. COIs that did not exceed the initial screening criteria (i.e., “No” in last column of Tables 3-3 and 3-4) were eliminated from further evaluation as COPCs. Less than 20 surface and subsurface soil samples were collected at SWMU 17; therefore, none of the COIs were eliminated based on low frequency of detection. However, it was noted that dibenzo(a,h)anthracene in surface soil was detected in only 1 of 15 samples analyzed.

TABLE 3-2

SWMU 17, LIST OF CONTAMINANTS OF INTEREST BY MEDIA
NAVSTA MAYPORT, FLORIDA

List of COIs	Surface Soil	Subsurface Soil	Groundwater
Volatile Organics			
2-Butanone	X		
Carbon Disulfide	X	X	
Toluene	X	X	
Xylenes, Total	X	X	
2-Methylnaphthalene		X	
Bis(2-Ethylhexyl)phthalate			X
Semivolatile Organics			
Benzo(a)anthracene	X		
Benzo(a)pyrene	X		
Benzo(b)fluoranthene	X		
Benzo(g,h,i)perylene	X		
Benzo(k)fluoranthene	X		
Bis(2-Ethylhexyl)phthalate	X		
Chrysene	X		
Di-n-butyl phthalate	X		
Dibenzo(a,h)anthracene	X		
Fluoranthene	X		
Indeno(1,2,3-cd)pyrene	X		
Naphthalene	X		
Phenanthrene	X		
Pyrene	X		
Pesticides/PCBs			
4,4'-DDD	X	X	
4,4'-DDE	X	X	
4,4'-DDT	X	X	
Aroclor-1260	X		
Chlordane	X		
Dieldrin	X		
Endrin	X	X	
Inorganics			
Aluminum	X		
Antimony	X		
Arsenic	X	X	X
Barium	X	X	X
Beryllium	X	X	
Cadmium	X		
Calcium	X		X
Chromium	X	X	
Cobalt	X		X
Copper	X		X
Cyanide	X	X	
Iron	X		X
Lead	X	X	
Magnesium	X		X
Manganese	X		X
Mercury	X	X	
Nickel	X		
Selenium	X		
Sodium	X		X
Tin	X	X	
Vanadium	X	X	X
Zinc	X	X	
Miscellaneous Parameters			
Ammonia, As Nitrogen			X
Chloride			X
Sulfate			X
Total Dissolved Solids			X

TABLE 3-3

SWMU 17, SURFACE SOIL INITIAL COPCs - INDUSTRIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA
PAGE 1 OF 2

CHEMICAL OF INTEREST	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL INDUSTRIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR [2]	INITIAL TARGET CRITERIA [3] (mg/kg)	EXCEEDS INITIAL TARGET LEVELS[4]
Volatile Organics								
2-Butanone	78-93-3	2/15	0.011	21,000	Developmental	2	10,500	No
Carbon Disulfide	75-15-0	3/15	0.003	1,400	Developmental -Neurological	10	140	No
Toluene	108-88-3	4/15	0.004	2,600	Kidney -Liver -Neurological	10	260	No
Xylenes, Total	1330-20-7	11/15	0.01	40,000	Body Weight -Mortality - Neurological	10	4,000	No
Semivolatile Organics								
Benzo(a)anthracene	56-55-3	2/15	0.17	5	Carcinogen	18	0.278	No
Benzo(a)pyrene	50-32-8	3/15	0.27	0.5	Carcinogen	18	0.0278	Yes
Benzo(b)fluoranthene	205-99-2	3/15	0.28	4.8	Carcinogen	18	0.267	Yes
Benzo(g,h,i)perylene	191-24-2	3/15	0.36	41,000	Neurological	10	4,100	No
Benzo(k)fluoranthene	207-08-9	3/15	0.37	52	Carcinogen	18	2.89	No
Bis(2-Ethylhexyl)phthalate	117-81-7	3/15	0.14	280	Carcinogen -Liver	18	15.56	No
Chrysene	218-01-9	3/15	0.29	450	Carcinogen	18	25.00	No
Di-n-butyl phthalate	84-74-2	3/15	0.044	140,000	Mortality	3	46,667	No
Dibenzo(a,h)anthracene	53-70-3	1/15	0.14	0.5	Carcinogen	18	0.028	Yes
Fluoranthene	206-44-0	5/15	0.36	48,000	Blood -Kidney -Liver	8	6,000	No
Indeno(1,2,3-cd)pyrene	193-39-5	3/15	0.28	5.3	Carcinogen	18	0.294	No
Naphthalene	91-20-3	1/15	0.21	270	Body Weight -Nasal	4	67.5	No
Phenanthrene	85-01-8	2/15	0.095	30,000	Kidney	6	5,000	No
Pyrene	129-00-0	5/15	0.28	37,000	Kidney	6	6,167	No
Pesticides and PCBs								
4,4'-DDD	72-54-8	3/15	0.012	18	Carcinogen	18	1.00	No
4,4'-DDE	72-55-9	13/15	0.52	13	Carcinogen	18	0.72	No
4,4'-DDT	50-29-3	11/15	0.22	13	Carcinogen -Liver	18	0.72	No
Aroclor-1260	11096-82-5	1/15	0.031	2.1	Carcinogen -Immunological	18	0.117	No
Chlordane	57-74-9	7/15	0.18	12	Carcinogen -Liver	18	0.67	No
Dieldrin	60-57-1	1/15	0.011	0.3	Carcinogen -Liver	18	0.0167	No
Endrin	72-20-8	1/15	0.0035	340	Liver	8	42.5	No
Inorganics								
Aluminum	7429-90-5	10/10	2,900				No Criteria	No Criteria
Antimony	7440-36-0	8/15	2.5	240	Blood -Mortality	4	60	No
Arsenic	7440-38-2	14/15	1.8	3.7	Carcinogen -Cardiovascular - Skin	18	0.206	Yes
Barium	7440-39-3	15/15	25.4	87,000	Cardiovascular	3	29,000	No
Beryllium	7440-41-7	10/15	0.17	800	Carcinogen -Gastrointestinal - Respiratory	18	44	No

TABLE 3-3

SWMU 17, SURFACE SOIL INITIAL COPCs - INDUSTRIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA
PAGE 2 OF 2

CHEMICAL OF INTEREST	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL INDUSTRIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR [2]	INITIAL TARGET CRITERIA [3] (mg/kg)	EXCEEDS INITIAL TARGET LEVELS[4]
Cadmium	7440-43-9	4/15	1.2	1,300	Carcinogen -Kidney	18	72	No
Calcium	7440-70-2	10/10	273,000				Nutrient	Nutrient
Chromium[5]	7440-47-3	15/15	20.2	420	Carcinogen -Respiratory	18	23	No
Cobalt	7440-48-4	6/15	1.6	110,000	Cardiovascular -Immunological -Neurological-Reproductive	10	11,000	No
Copper	7440-50-8	12/15	18.4	73,000	None Specified	1	73,000	No
Cyanide	57-12-5	3/15	0.25	39,000	Body Weight -Neurological -Thyroid	10	3,900	No
Iron	7439-89-6	10/10	3,320	480,000	Blood -Gastrointestinal	4	120,000	No
Lead	7439-92-1	15/15	252	920	Neurological	10	92	Yes
Magnesium	7439-95-4	10/10	1,850				Nutrient	Nutrient
Manganese	7439-96-5	10/10	78.6	22,000	Neurological	10	2,200	No
Mercury	7439-97-6	7/15	0.14	26	Neurological	10	2.6	No
Nickel	7440-02-0	1/15	10.4	28,000	Body Weight	4	7,000	No
Selenium	7782-49-2	4/15	0.44	10,000	Hair Loss -Neurological -Skin	10	1,000	No
Sodium	7440-23-5	10/10	715				Nutrient	Nutrient
Tin	7440-31-5	9/15	69	660,000	Kidney -Liver	8	82,500	No
Vanadium	7440-62-2	15/15	13.5	7,400	None Specified	1	7,400	No
Zinc	7440-66-6	15/15	91.2	560,000	Blood	4	140,000	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Industrial - Chapter 62-777 F.A.C., May 1999
2 - Adjusted Divisor is determined by the number of carcinogens or chemicals that affect the same target organ.
3 - The SCTL for direct exposure to soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative effects.
4 - Comparison of the Initial Target Criteria with the Maximum Concentration.
5 - SCTL Industrial screening values used for Chromium (Hexavalent)

TABLE 3-4

SWMU 17, SURFACE SOIL COPCs - LEACHING
NAVSTA MAYPORT, FLORIDA
Page 1 of 2

CHEMICAL OF INTEREST	CAS NUMBER	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	SCTL LEACHING TO GROUNDWATER [1] (mg/kg)	SCTL LEACHING TO SURFACE WATER [2] (mg/kg)	LEACHING TARGET CRITERIA [3] (mg/kg)	COPCs[4] (Yes/No)
Volatile Organics							
2-Butanone	78-93-3	2/15	0.011	17	NA	17	No
Carbon Disulfide	75-15-0	3/15	0.003	5.6	NA	5.6	No
Toluene	108-88-3	4/15	0.004	0.5	NA	0.5	No
Xylenes, Total	1330-20-7	11/15	0.01	0.2	NA	0.2	No
Semivolatile Organics							
Benzo(a)anthracene	56-55-3	2/15	0.17	3.2	NA	3.2	No
Benzo(a)pyrene	50-32-8	3/15	0.27	8	NA	8	No
Benzo(b)fluoranthene	205-99-2	3/15	0.28	10	NA	10.000	No
Benzo(g,h,i)perylene	191-24-2	3/15	0.36	32,000	NA	32,000	No
Benzo(k)fluoranthene	207-08-9	3/15	0.37	25	NA	25	No
Bis(2-Ethylhexyl)phthalate	117-81-7	3/15	0.14	3,600	NA	3,600	No
Chrysene	218-01-9	3/15	0.29	77	NA	77	No
Di-n-butyl phthalate	84-74-2	3/15	0.044	47	NA	47	No
Dibenzo(a,h)anthracene	53-70-3	1/15	0.14	30	NA	30	No
Fluoranthene	206-44-0	5/15	0.36	1,200	NA	1,200	No
Indeno(1,2,3-cd)pyrene	193-39-5	3/15	0.28	28	NA	28	No
Naphthalene	91-20-3	1/15	0.21	1.7	NA	1.7	No
Phenanthrene	85-01-8	2/15	0.095	250	NA	250	No
Pyrene	129-00-0	5/15	0.28	880	NA	880	No
Pesticides and PCBs							
4,4'-DDD	72-54-8	3/15	0.012	4	NA	4	No
4,4'-DDE	72-55-9	13/15	0.52	18	NA	18	No
4,4'-DDT	50-29-3	11/15	0.22	11	NA	11	No
Aroclor-1260	11096-82-5	1/15	0.031	17	NA	17	No
Chlordane	57-74-9	7/15	0.18	9.6	NA	9.6	No
Dieldrin	60-57-1	1/15	0.011	0.004	NA	0.004	Yes
Endrin	72-20-8	1/15	0.0035	1	NA	1	No

TABLE 3-4

SWMU 17, SURFACE SOIL COPCs - LEACHING
NAVSTA MAYPORT, FLORIDA
Page 2 of 2

CHEMICAL OF INTEREST	CAS NUMBER	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	SCTL LEACHING TO GROUNDWATER [1] (mg/kg)	SCTL LEACHING TO SURFACE WATER [2] (mg/kg)	LEACHING TARGET CRITERIA [3] (mg/kg)	COPCs[4] (Yes/No)
Inorganics							
Aluminum	7429-90-5	10/10	2,900	No Criteria	NA	No Criteria	No
Antimony	7440-36-0	8/15	2.5	5	NA	5	No
Arsenic	7440-38-2	14/15	1.8	29	NA	29	No
Barium	7440-39-3	15/15	25.4	1600	NA	1600	No
Beryllium	7440-41-7	10/15	0.17	63	NA	63	No
Cadmium	7440-43-9	4/15	1.2	8	NA	8	No
Calcium	7440-70-2	10/10	273,000	No Criteria	NA	No Criteria	No
Chromium[4]	7440-47-3	15/15	20.2	38	NA	38	No
Cobalt	7440-48-4	6/15	1.6	No Criteria	NA	No Criteria	No
Copper	7440-50-8	12/15	18.4	No Criteria	NA	No Criteria	No
Cyanide	57-12-5	3/15	0.25	40	NA	40	No
Iron	7439-89-6	10/10	3,320	No Criteria	NA	No Criteria	No
Lead	7439-92-1	15/15	252	No Criteria	NA	No Criteria	No
Magnesium	7439-95-4	10/10	1,850	No Criteria	NA	No Criteria	No
Manganese	7439-96-5	10/10	78.6	No Criteria	NA	No Criteria	No
Mercury	7439-97-6	7/15	0.14	2.1	NA	2.1	No
Nickel	7440-02-0	1/15	10.4	130	NA	130	No
Selenium	7782-49-2	4/15	0.44	5	NA	5	No
Sodium	7440-23-5	10/10	715	No Criteria	NA	No Criteria	No
Tin	7440-31-5	9/15	69	No Criteria	NA	No Criteria	No
Vanadium	7440-62-2	15/15	13.5	980	NA	980	No
Zinc	7440-66-6	15/15	91.2	6,000	NA	6,000	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Soil leaching to groundwater - Chapter 62-777 F.A.C, May 1999
2 - SCTL - Soil Cleanup Target Level for Soil leaching to surface water - Chapter 62-777 F.A.C, May 1999
3 - Minimum SCTL based to soil leaching to groundwater and soil leaching to surface water (if applicable).
4 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the leaching target criteria.
5 - SCTL screening values used for Chromium (Hexavalent)
NA – Applicable

TABLE 3-5

SWMU 17, SUBSURFACE SOIL INITIAL COPCs - INDUSTRIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	SCTL INDUSTRIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR [2]	INITIAL TARGET CRITERIA [3] (mg/kg)	EXCEEDS INITIAL TARGET LEVELS[4]
Volatile Organics								
2-Butanone	78-93-3	1/3	0.006	21,000	Developmental	2	10,500	No
Carbon Disulfide	75-15-0	1/3	0.003	1,400	Developmental -Neurological	6	233	No
Toluene	108-88-3	1/3	0.002	2,600	Kidney -Liver -Neurological	6	433	No
Xylenes, Total	1330-20-7	3/3	0.003	40,000	Body Weight -Mortality -Neurological	6	6,667	No
2-Methylnaphthalene	91-57-6	1/3	0.17	560	Body Weight -Nasal	3	187	No
Pesticides and PCBs								
4,4'-DDD	72-54-8	2/3	0.065	18	Carcinogen	6	3	No
4,4'-DDE	72-55-9	2/3	0.18	13	Carcinogen	6	2.17	No
4,4'-DDT	50-29-3	1/3	0.0041	13	Carcinogen -Liver	6	2.17	No
Endrin	72-20-8	1/3	0.2	340	Liver	4	85	No
Inorganics								
Arsenic	7440-38-2	3/3	0.38	3.7	Carcinogen -Cardiovascular -Skin	6	0.62	No
Barium	7440-39-3	3/3	4.2	87,000	Cardiovascular	2	43,500	No
Beryllium	7440-41-7	1/3	0.09	800	Carcinogen -Gastrointestinal -Respiratory	6	133	No
Chromium[5]	7440-47-3	1/3	4.1	420	Carcinogen -Respiratory	6	70	No
Cyanide	57-12-5	3/3	1.8	39,000	Body Weight -Neurological -Thyroid	6	6,500	No
Lead	7439-92-1	3/3	6.6	920	Neurological	6	153	No
Mercury	7439-97-6	1/3	0.03	26	Neurological	6	4.33	No
Tin	7440-31-5	2/3	5.3	660,000	Kidney -Liver	4	165,000	No
Vanadium	7440-62-2	3/3	4.4	7,400	None Specified	1	7,400	No
Zinc	7440-66-6	3/3	9.5	560,000	Blood	1	560,000	No
Miscellaneous Parameters								
Total Organic Carbon	7440-44-0	1/1	691					

Notes:
1 - SCTL - Soil Cleanup Target Level for Industrial - Chapter 62-777 F.A.C., May 1999
2 - Adjusted Divisor is determined by the number of carcinogens or chemicals that affect the same target organ.
3 - The SCTL for direct exposure with soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor carcinogenic COPCs or noncarcinogenic COPCs that affect the same target organ/system to account for cumulative effects.
4 - Comparison of the Initial Target Criteria with the Maximum Concentration.
5 - SCTL Industrial screening values used for Chromium (Hexavalent)

TABLE 3-6

SWMU 17, SUBSURFACE SOIL COPCs - LEACHING
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	SCTL LEACHING TO GROUNDWATER [1] (mg/kg)	SCTL LEACHING TO SURFACE WATER [2] (mg/kg)	LEACHING TARGET CRITERIA [3] (mg/kg)	COPCs[4] (Yes/No)
Volatile Organics								
2-Butanone	78-93-3	OV	1/3	0.006	17	NA	17	No
Carbon Disulfide	75-15-0	OV	1/3	0.003	5.6	NA	5.6	No
Toluene	108-88-3	OV	1/3	0.002	0.5	NA	0.5	No
Xylenes, Total	1330-20-7	OV	3/3	0.003	0.2	NA	0.2	No
2-Methylnaphthalene	91-57-6	OV	1/3	0.17	6.1	NA	6.1	No
Pesticides and PCBs								
4,4'-DDD	72-54-8	PES	2/3	0.065	4	NA	4	No
4,4'-DDE	72-55-9	PES	2/3	0.18	18	NA	18	No
4,4'-DDT	50-29-3	PES	1/3	0.0041	11	NA	11	No
Endrin	72-20-8	PES	1/3	0.2	1	NA	1	No
Inorganics								
Arsenic	7440-38-2	M	3/3	0.38	29	NA	29	No
Barium	7440-39-3	M	3/3	4.2	1,600	NA	1,600	No
Beryllium	7440-41-7	M	1/3	0.09	63	NA	63	No
Chromium[5]	7440-47-3	M	1/3	4.1	38	NA	38	No
Cyanide	57-12-5	M	3/3	1.8	40	NA	40	No
Lead	7439-92-1	M	3/3	6.6	No Criteria	NA	No Criteria	No
Mercury	7439-97-6	M	1/3	0.03	2.1	NA	2.1	No
Tin	7440-31-5	M	2/3	5.3	No Criteria	NA	No Criteria	No
Vanadium	7440-62-2	M	3/3	4.4	980	NA	980	No
Zinc	7440-66-6	M	3/3	9.5	6,000	NA	6,000	No
Miscellaneous Parameters								
Total Organic Carbon	7440-44-0	MISC	1/1	691	No Criteria	NA	No Criteria	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Soil leaching to groundwater - Chapter 62-777 F.A.C., May 1999
2 - SCTL - Soil Cleanup Target Level for Soil leaching to surface water - Chapter 62-777 F.A.C., May 1999
3 - Minimum SCTL based to soil leaching to groundwater and soil leaching to surface water (if applicable).
4 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the leaching target criteria.
5 - SCTL screening value used for Chromium (Hexavalent)
NA - Applicable

The final screening of surface and subsurface soil COPCs was performed by comparing the maximum concentrations of only the COIs that failed the initial screening (i.e., “Yes” in last column of Tables 3-3 and 3-4) against the minimum SCTL, either the adjusted SCTL for direct contact or the leaching to groundwater SCTL. For surface soil the SCTLs for direct contact were adjusted for the final COPC screening because four carcinogenic contaminants with potential cumulative effects were present in soil at concentrations representing significant cancer risk levels. The SCTLs for these contaminants [benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and arsenic] were divided by four to ensure that the FDEP requirement of cumulative cancer risk no greater than 1.0 x 10^{-6} was met. Multiple noncarcinogenic COPCs affecting the same target organ/system were not present in surface soil; therefore, the FDEP requirement for a total HI no greater than 1 was met by comparing the detected concentrations of noncarcinogens (dieldrin and lead) to the published SCTLs.

Table 3-7 presents the comparisons of maximum detections of COIs in surface and subsurface soil, respectively, with the final SCTLs and lists the contaminants selected as final COPCs in soil. As shown in Table 3-7 (and dieldrin for leaching), four COIs were identified as COPCs in surface soil. The contaminants listed below were identified as COPCs in surface soil:

- benzo(a)pyrene
- dibenzo(a,h)anthracene
- dieldrin
- arsenic

3.2.3 <u>Selection of Soil COCs – Human Health</u>

Fifteen surface soil samples were collected at SWMU 17; therefore, a 95 percent UCL was calculated for each of the four final COPCs and compared to the maximum detected concentration of each COPC to determine the site representative concentration (see Appendix B). The 95 percent UCL concentration for only arsenic was less than the maximum detected concentration; therefore, the 95 percent UCL was used as the site representative concentration for arsenic. For the remaining COPCs, the 95 percent UCL was greater than the detected maximum; therefore, the maximum detected concentration was used as the site representative concentration (Tables 3-8 and 3-9).

For benzo(a)pyrene, dibenzo(a,h)anthracene, and arsenic, the MCS in surface soil was determined by the SCTL for soil that was adjusted for the carcinogenic affects of these three COPCs. The MCSs for dieldrin were determined by the soil leaching to groundwater SCTL. Background concentrations did not affect the MCS because background was not considered for organic compound, and arsenic was not detected in the background surface soil samples at NAVSTA Mayport. It was noted that although dieldrin exceeded the SCTL for leaching to groundwater and the sample in which it was detected was located in a

TABLE 3-7

SWMU 17, SURFACE SOIL FINAL COPCs - INDUSTRIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

INITIAL COPC	CAS NUMBER	MAXIMUM CONCENTRATION (mg/kg)	SCTL INDUSTRIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[2]				ADJUSTMENT DIVISOR [3]	DIRECT EXPOSURE TARGET CRITERIA[4] (mg/kg)	COPC BASED ON INDUSTRIAL DIRECT EXPOSURE[5] (Yes/No)
					Carcinogen	Cardiovascular	Skin	Neurological			
Benzo(a)pyrene	50-32-8	0.27	0.5	Carcinogen	0.54				4	0.125	Yes
Benzo(b)fluoranthene	205-99-2	0.28	4.8	Carcinogen	0.058				4	1.2	No
Dibenzo(a,h)anthracene	53-70-3	0.14	0.5	Carcinogen	0.28				4	0.125	Yes
Arsenic	7440-38-2	1.8	3.7	Carcinogen - Cardiovascular -Skin	0.486	0.486	0.486		4	0.925	Yes
Lead	7439-92-1	252	920	Neurological				0.274	1	920	No
				Cumulative Sum	1.365	0.486	0.486	0.274			

Notes:
1 - SCTL - Soil Cleanup Target Level for Industrial - Chapter 62-777 F.A.C., May 1999
2 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
3 - Adjusted Divisor is determined by the number of carcinogens or chemicals that affect the same target organ.
4 - The SCTL for direct exposure with soil in an industrial setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative effects.
5 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the COPC target criteria.

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TABLE 3-8

SWMU 17, SURFACE SOIL COCs - INDUSTRIAL DIRECT CONTACT
NAVSTA MAYPORT, FLORIDA

COPCs	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	REPRESENTATIVE CONCENTRATION[1] (mg/kg)	SCTL INDUSTRIAL[2] (mg/kg)	BACKGROUND CONCENTRATION[3] (mg/kg)	TARGET ORGAN/ SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[4]			ADJUSTMENT DIVISOR [5]	MEDIA CLEANUP STANDARD - DIRECT EXPOSURE[6] (mg/kg)	COC BASED ON INDUSTRIAL DIRECT EXPOSURE[7]
								Carcinogen	Cardiovascular	Skin			
Benzo(a)pyrene	50-32-8	3/15	0.27	0.27	0.5	-	Carcinogen	0.54			3	0.167	Yes
Dibenzo(a,h) anthracene	53-70-3	1/15	0.14	0.14	0.5	-	Carcinogen	0.28			3	0.167	No
Arsenic	7440-38-2	14/15	1.8	1.13	3.7	-	Carcinogen - Cardiovascular - Skin	0.4865	0.4865	0.4865	3	1.233	No
							Cumulative Sum	1.3065	0.4865	0.4865			

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - SCTL - Soil Cleanup Target Level for Industrial - Chapter 62-777 F.A.C., May 1999
3 - Mayport background screening value (Tetra Tech NUS, 2000).
4 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
5 - Adjusted Divisor is determined by the number of carcinogens or chemicals that affect the same target organ. If the Cumulative Sum is less than 1, then the Adjustment Divisor is equal to 1.
6 - The Media Cleanup Standard (MCS) Direct Exposure is the Industrial SCTL divided by Adjustment Divisor or the background concentration, whichever is greater.
7 - A COPC is selected as a COC if the representative concentration exceeds the Media Cleanup Standard - Direct Exposure. (Site specific SCTL)

TABLE 3-9

SWMU 17, SURFACE SOIL COCs - LEACHING
NAVSTA MAYPORT, FLORIDA

COPCs	CAS NUMBER	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	REPRESENTATIVE CONCENTRATION[1] (mg/kg)	SCTL LEACHING TO GROUNDWATER[2] (mg/kg)	SCTL LEACHING TO SURFACE WATER[3] (mg/kg)	BACKGROUND CONCENTRATION[4] (mg/kg)	MEDIA CLEANUP STANDARD LEACHING[5] (mg/kg)	LEACHING COCs[6]
Dieldrin	60-57-1	1/15	0.011	0.011	0.004	NA	-	0.004	Yes

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - SCTL - Soil Cleanup Target Level for Leaching to Groundwater - Chapter 62-777 F.A.C., May 1999
3 - SCTL - Soil Cleanup Target Level for Soil leaching to surface water - Chapter 62-777 F.A.C, May 1999
4 - Mayport background screening value (Tetra Tech NUS, 2000).
5 - The Media Cleanup Standard (MCS) Leaching is the Leaching to Groundwater SCTL or the background screening value, whichever is greater.
6 - A COPC is selected as a COC if the representative concentration exceeds the MCS.
NA - Not Applicable

nonpaved location of the site, dieldrin was not detected in any of the groundwater samples (see Section 3.2.4). As shown in Table 3-10, the site representative concentrations of two organic COPCs were selected as COCs in surface soil for SWMU 17, as listed below:

- benzo(a)pyrene
- dieldrin

The number and locations of samples containing COCs that exceeded the MCSs for surface soil are the primary factors used to determine the volumes and areas of contaminated soil. Table 3-11 presents the locations, concentrations, and sampling dates for all surface soil samples that contain COC concentrations exceeding the MCSs. The table shows one surface soil sample location, MPT-17-SS08, exceeded the MCS for benzo(a)pyrene and one location, MPT-17-SS02, exceeded the MCS for dieldrin.

3.2.4 Screening of Groundwater COPCs – Human Health

The initial COPC screening process identified four contaminants and total dissolved solids in groundwater that exceeded the GCTLs (or the adjusted GCTLs). Because SWMU 17 is located more than 300 feet from the Mayport Turning Basin and because of the industrial site setting, the discharge of groundwater into marine surface water was not evaluated as a pathway of concern for human receptors. The GCTLs for nearly all COIs, because they are based on primary or secondary drinking water standards, were not adjusted to account for the site-specific number of carcinogens or noncarcinogenic contaminants present in groundwater that affect the same target organ. Table 3-12 presents the initial screening process and lists all contaminants detected in groundwater, their maximum concentrations and corresponding locations, sampling date, the State of Florida GCTLs for drinking water, and identifies the initial COPCs. COIs that did not exceed the initial screening criteria (i.e., “No” in last column of Table 3-12) were eliminated from further evaluation as COPCs. Less than 20 groundwater samples were collected at SWMU 17; therefore, none of the COIs were eliminated based on frequency of detection.

The final screening of groundwater COPCs was performed by comparing the maximum concentrations of only the COIs that failed the initial screening (i.e., “Yes” in last column of Table 3-12) against the GCTL, or the adjusted GCTL, for groundwater. No adjustment to the GCTLs for any of the COPCs was required in the final screening because multiple contaminants contributing significant noncancer risk to the same target organ/system were not present. Table 3-13 presents the comparison of maximum detections of COIs with the GCTLs and lists the contaminants selected as final COPCs. As shown in Table 3-13, four COIs and TDSs were identified as COPCs in groundwater, as listed below:

- bis(2-ethylhexyl)phthalate
- manganese
- iron
- ammonia
- total dissolved solids

TABLE 3-10

SWMU 17, SURFACE SOIL COCs - INDUSTRIAL DIRECT CONTACT AND LEACHING (COMBINED)
NAVSTA MAYPORT, FLORIDA

COCs	CAS NUMBER	MAXIMUM CONCENTRATION (mg/kg)	REPRESENTATIVE CONCENTRATION[1] (mg/kg)	BACKGROUND CONCENTRATION[2] (mg/kg)	SITE-SPECIFIC SCTL - INDUSTRIAL DIRECT EXPOSURE[3] (mg/kg)	SITE-SPECIFIC SCTL - LEACHING TO GROUNDWATER[4] (mg/kg)	MEDIA CLEANUP STANDARD[5] (mg/kg)	MEDIA CLEANUP STANDARD BASIS[6]
Benzo(a)pyrene	50-32-8	0.27	0.27	-	0.167	-	0.167	Direct Contact
Dieldrin	60-57-1	0.011	0.011	-	-	0.004	0.004	Leaching

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - Mayport background concentration (Tetra Tech NUS, 2000).
3 - The Site specific SCTL - Direct Exposure is the Industrial SCTL divided by the Adjustment Divisor or the background concentration, whichever is greater.
4 - The Site Specific SCTL - Leaching to Groundwater is the Leaching to Groundwater SCTL or the background concentration, whichever is greater.
5 - Media Cleanup Standard is the Minimum of the Site Specific SCTL - Direct Exposure or Site Specific SCTL - Leaching to Groundwater.
6 - Media Cleanup Standard Basis is either Background, Direct Exposure or Leaching (Leaching to Groundwater or Leaching to Surface Water, if applicable.

TABLE 3-11

SWMU 17, EXCEEDANCES OF COCs IN SURFACE SOIL
NAVSTA MAYPORT, FLORIDA

COC	Sample Location	Sample ID	Sample Date	Detected Concentrations (mg/kg)	MCS (mg/kg)
Dieldrin	MPT-17-SS02	17S00201	04/11/95	11	0.1667
Benzo(a)pyrene	MPT-17-SS08	17S00801	04/11/95	270 J	0.004

TABLE 3-12

SWMU 17, GROUNDWATER INITIAL COPCs - GCTLs
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (µg/L)	GCTL[1] (µg/L)	TARGET CRITERIA[2]	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR[3]	INITIAL TARGET LEVEL[4] (µg/L)	EXCEEDS INITIAL TARGET LEVEL[5]
Constituents without Primary or Secondary Standards									
Calcium	7440-70-2	3/3	163,000	Nutrient	Nutrient		1	Nutrient	Nutrient
Cobalt	7440-48-4	1/3	3.9	420	HH	Cardiovascular Immunological Neurological Reproductive	1	420	No
Magnesium	7439-95-4	3/3	10,700	Nutrient	Nutrient		1	Nutrient	Nutrient
Vanadium	7440-62-2	3/3	8.2	49	HH	None Specified	1	49	No
Ammonia, As Nitrogen		3/3	11,500	2,800	HH	Respiratory	1	2,800	Yes
Sulfide	18496-25-8	1/3	4,000	No Criteria	No Criteria		1	No Criteria	No Criteria
Constituents with Primary or Secondary Standards									
Arsenic	7440-38-2	3/3	3.3	50	P/S		1	50	No
Barium	7440-39-3	3/3	21.9	2,000	P/S		1	2,000	No
Copper	7440-50-8	1/3	1.3	1,000	P/S		1	1,000	No
Iron	7439-89-6	3/3	2,220	300	P/S		1	300	Yes
Manganese	7439-96-5	3/3	295	50	P/S		1	50	Yes
Sodium	7440-23-5	3/3	25,400	160,000	P/S		1	160,000	No
Chloride	16887-00-6	3/3	34,900	250,000	P/S		1	250,000	No
Sulfate	14808-79-8	3/3	75,100	250,000	P/S		1	250,000	No
Total Dissolved Solids		3/3	581,000	500,000	P/S		1	500,000	Yes
Bis(2-Ethylhexyl)phthalate	117-81-7	2/3	8	6	P/S		1	6	Yes

Notes:
1 - GCTL - Groundwater Cleanup Target Levels - Chapter 62-777 F.A.C. May 1999
2 - P/S - Primary Standard/Secondary Standard - F.A.C. 62-550 and Chapter 62-777, Table 1, dated May 1999. HH - Human Health Criteria.
3 - Adjustment Divisor is determined by the number of carcinogens or chemicals that affect the same target organ. Adjustment Divisor for Primary/Secondary Standard is 1.
4 - The GCTL from Chapter 62-777 F.A.C., Table 1, was divided by the number (i.e., adj. divisor) of carcinogenic COPCs or noncarcinogenic COPCs that affect the same target organ/system to account for cumulative effects.
5 - Comparison of the Initial Target Levels with the Maximum Concentration.

TABLE 3-13

SWMU 17, GROUNDWATER FINAL COPCs - GCTLs
NAVSTA MAYPORT, FLORIDA

INITIAL COPCs	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (µg/L)	GCTL[1] (µg/L)	TARGET CRITERIA[2]	TARGET ORGAN/ SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[3]	ADJUSTMENT DIVISOR[4]	FINAL TARGET LEVEL[5] (µg/L)	EXCEEDS FINAL TARGET LEVEL[6]
							Respiratory			
Constituents without Primary or Secondary Standards										
Ammonia, As Nitrogen		3/3	11,500	2,800	HH	Respiratory	4.11	1	2,800	Yes
Constituents with Primary or Secondary Standards										
Iron	7439-89-6	3/3	2,220	300	P/S			1	300	Yes
Manganese	7439-96-5	3/3	295	50	P/S			1	50	Yes
Total Dissolved Solids		3/3	581,000	500,000	P/S			1	500,000	Yes
Bis(2-Ethylhexyl)phthalate	117-81-7	2/3	8	6	P/S			1	6	Yes
						Cumulative Sum	4.11			

Notes:
1 - GCTL - Groundwater Cleanup Target Levels - Chapter 62-777 F.A.C. May 1999
2 - P/S - Primary Standard/Secondary Standard - F.A.C. 62-550 and Chapter 62-777, Table 1, dated May 1999. HH - Human Health Criteria.
3 - The ratio of the maximum detected concentration to the GCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
4 - Adjustment Divisor is determined by the number of carcinogens or chemicals that affect the same target organ. Adjustment Divisor for Primary/Secondary Standard is 1.
5 - The GCTL from Chapter 62-777 F.A.C., Table 1, was divided by the number (i.e., adj. divisor) of carcinogenic COPCs or noncarcinogenic COPCs that affect the same target organ/system to account for cumulative effects.
6 - Comparison of the Initial Target Levels with the Maximum Concentration.

The relatively low concentrations of sodium and chloride detected in the groundwater (compared to the GCTLs) suggest that seawater intrusion or former dredge material used as fill have little current impact on the water quality of the Surficial Aquifer in the vicinity of SWMU 17.

3.2.5 Selection of Groundwater COCs – Human Health

Four COPCs and TDS shown in Table 3-13 were identified as COPCs in groundwater at SWMU 17. Because less than ten groundwater samples were collected, a 95 percent UCL concentration was not calculated, and the maximum detected concentration of each COPC was used as the site representative concentration (Table 3-14).

The maximum concentration of BEHP detected in groundwater, 8 µg/L, was only marginally greater than the GCTL of 6 µg/L used to identify COPCs in Table 3-13. Also, only one of the three wells at the site contained an exceedance of this COPC. The USEPA considers BEHP to be a common laboratory contaminant. Therefore, because of the industrial setting, and because groundwater is not currently used and is unlikely to be used in the future as a domestic water source, BEHP was not considered for further evaluation as a human health COC in groundwater at SWMU 17.

The GCTLs for all final COPCs in groundwater, with the exception of ammonia, were based on primary or secondary standards. Furthermore, multiple noncarcinogenic COPCs known to affect the same target organ or system were not present in the list of final COPCs. Therefore, no adjustment was made to the GCTLs for any of the final COPCs evaluated as COCs, as shown in Table 3-14.

The MCSs for all COPCs in groundwater were determined by the GCTLs for direct contact with groundwater. However, for iron, manganese, and TDS, the MCSs were replaced by the Mayport background screening value that was greater than the GCTLs (Table 3-12). As shown in Table 3-14, the representative concentrations of three COPCs in groundwater exceeded the MCSs and they were selected as COCs for further evaluation in this CMS, as listed below:

- iron
- manganese
- ammonia

Table 3-15 provides a summary of the groundwater COCs. The number and locations of samples containing COCs that exceeded the MCSs are the primary factors used to determine the volumes and areas of contaminated groundwater. Table 3-16 presents the locations, concentrations, and sampling dates for all groundwater samples that contain COC concentrations exceeding the MCS criteria. As shown in the table, manganese exceeded the MCSs in all three wells at SWMU 17, iron exceeded the MCSs in two wells, and ammonia exceeded the MCSs in only one well.

TABLE 3-14

SWMU 17, GROUNDWATER COCs - GCTLs
NAVSTA MAYPORT, FLORIDA

COPCs	CAS NUMBER	MAXIMUM CONCENTRATION (µg/L)	REPRESENTATIVE CONCENTRATION[1] (µg/L)	GCTL[2]	TARGET CRITERIA[3]	BACKGROUND CONCENTRATION[4] (µg/L)	TARGET ORGAN/ SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[5]	ADJUSTMENT DIVISOR[6]	SITE SPECIFIC CLEANUP STANDARD - GCTL[7] (µg/L)	COCS BASED ON GCTLs[8]
								Respiratory			
Constituents without Primary or Secondary Standards											
Ammonia, As Nitrogen		11,500	11,500	2,800	HH	2,100	Respiratory	4.11	1	2,800	Yes
Constituents with Primary or Secondary Standards											
Iron	7439-89-6	2,220	2,220	300	P/S	494			1	300	Yes
Manganese	7439-96-5	295	295	50	P/S	141			1	50	Yes
Total Dissolved Solids		581,000	581,000	500,000	P/S	3,762,000			1	3,762,000	No
Bis(2-Ethylhexyl) phthalate	117-81-7	8	8	6	P/S	-			1	6	No[9]
						Cumulative Sum	4.11				

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - GCTL - Groundwater Cleanup Target Levels - Chapter 62-777 F.A.C. May 1999
3 - P/S - Primary Standard/Secondary Standard - F.A.C. 62-550 and Chapter 62-777, Table 1, dated May 1999. HH - Human Health Criteria.
4 - Mayport background screening value (Tetra Tech NUS, 2000).
5 - The ratio of the maximum detected concentration to the GCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
6 - Adjustment Divisor is determined by the number of carcinogens or chemicals that affect the same target organ. Adjustment Divisor for Primary/Secondary Standard is 1.
7 - The Adjusted Media Cleanup Standard (MCS) is the GCTL or the background screening value, whichever is greater.
8 - A COPC is selected as a COC if the representative concentration exceeds the MCS.
9 - See Section 3.2.5 for explanation.

TABLE 3-15

SWMU 17, GROUNDWATER COCs
NAVSTA MAYPORT, FLORIDA

COCs	CAS NUMBER	MAXIMUM CONCENTRATION (µg/L)	REPRESENTATIVE CONCENTRATION[1] (µg/L)	BACKGROUND CONCENTRATION[2] (µg/L)	SITE SPECIFIC CLEANUP STANDARD - GCTL[3] (µg/L)	SITE SPECIFIC CLEANUP STANDARD - LEACHING TO MARINE SURFACE WATER[4] (µg/L)	MEDIA CLEANUP STANDARD[5] (µg/L)	MEDIA CLEANUP STANDARD BASIS[6]
Ammonia, As Nitrogen	7439-89-6	11,500	11500	2100	2800	-	2800	GCTL
Iron	7439-89-6	2220	2220	494	300	-	300	GCTL
Manganese	7439-96-5	295	295	141	50	-	50	GCTL

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - Mayport background concentration (Tetra Tech NUS, 2000).
3 - The Site Specific Cleanup Standard GCTL is the Groundwater CTL or the background concentration, whichever is greater.
4 – The Site Specific Cleanup Standard for Leaching to Marine Surfacewater, Chapter 62-777, F.A.C.
5 - Media Cleanup Standard is the Minimum of the Site Specific Cleanup Standard GCTL or Site Specific Cleanup Standard - Leaching to Marine Surface Water
6 - Media Cleanup Standard Basis is either GCTL, Marine Surface Water, or Background.

TABLE 3-16

SWMU 17, EXCEEDANCES OF COCs IN GROUNDWATER
NAVSTA MAYPORT, FLORIDA

COC	SAMPLE LOCATION	SAMPLE ID[1]	SAMPLE DATE	DETECTED CONCENTRATIONS[2] (µg/L)	MCS (µg/L)
Iron	MPT-17-MW01S	17G00101	06/18/95	988	494
		17G00101D	06/18/95	1,110	
	MPT-17-MW02S	17G00201	06/18/95	2,220	
Manganese	MPT-17-MW01S	17G00101	06/18/95	294	141
		17G00101D	06/18/95	295	
	MPT-17-MW02S	17G00201	06/18/95	221	
	MPT-17-MW03S	17G00301	06/18/95	172	
Ammonia, as nitrogen	MPT-17-MW03S	17G00301	06/18/95	11,500	2,800

Notes:

1 - “D” at end of Sample ID indicates duplicate sample.
2 - All units µg/L, except pH in standard units.

3.3 CONTAMINANTS OF CONCERN – ECOLOGICAL

Exposure of terrestrial receptors was not evaluated in the RFI because the area use is industrial and the site is mostly covered by structures or paved. With the exception of iron, maximum exposure point concentrations were determined in the RFI to be less than the lowest toxicity benchmark concentrations for all COPC-Es in groundwater. The maximum and average exposure concentrations of iron in groundwater of 2,220 and 1,166 µg/L, respectively, exceeded both the Florida surface water quality standard of 300 µg/L and the lowest reported adverse effect concentration for dinoflagellate population growth of 100 µg/L. However, as recognized in the RFI, the maximum and background screening concentrations of iron determined from the NAVSTA Mayport background monitoring wells [660 and 494 µg/L, respectively (see Table 1-1)] also exceed the toxicity benchmarks. Using the same rationale as the RFI, the potential exposure concentration for aquatic receptors in the Mayport Turning Basin is considered to probably be less than the maximum detected concentration due to groundwater transport mechanisms such as dispersion, mixing, and retardation and because all of the iron present in the groundwater samples may not be biologically available as a dissolved fraction. Furthermore, three surface water samples (MPT-B-SW10, -SW11, and -SW12) collected from the Mayport Turning Basin during the station-wide background study conducted during the GIR did not detect iron in the surface water; the data suggest that ongoing impacts from groundwater discharging to surface water were not indicated. Thus, the discharge of iron in groundwater to surface water is not expected to present significant risk for aquatic receptors in the Mayport Turning Basin. Therefore, COPC-Es were not evaluated further in this CMS.

3.4 VOLUMES OF CONTAMINATED MEDIA

Estimates of contaminated media volumes are made by identifying the areas exceeding the MCSs. Soil analysis data were compared with the corresponding MCS only (no ecological concerns due to the absence of terrestrial ecological receptors and the presence of an asphalt cover at the site located in the industrialized area), and contaminated soil area maps were prepared. Furthermore, for groundwater, the monitoring well data were also compared with the MCS only (no ecological risks because groundwater discharges from SWMU 17 through the benthic zone to the surface water of Mayport Turning Basin do not pose a risk to aquatic receptors), and plume maps were prepared. Perimeter areas surrounding the contaminated wells and soil boring locations were also included, based on interpolation, as part of the impacted areas so that the area and volume estimates reflect adequate delineation of the contaminants.

3.4.1 Volume of Soil

Based on the data collected during the RFI, areas of organic contamination within and near SWMU 17 were identified that exceeded the MCS for the surface soil. Because no human health or ecological

COCs were identified for subsurface soil, the volume of contaminated subsurface soil was not calculated. The area and volume of surface soil contamination are based solely on human health risks because there are no ecological concerns due to the absence of terrestrial ecological receptors and the presence of an asphalt cover at the site which is located in an industrialized area. There are two separate areas of soil contamination, which both consist of organic contamination. The estimated area of contamination is approximately 15,700 ft^2 of organics [7,850 ft^2 of benzo(a)pyrene and 7,850 ft^2 of dieldrin]. Contaminated soil thickness ranged from 0 to 2 ft for the surface soil. The total estimated volume is approximately 1,164 yd^3 of organic [582 yd^3 benzo(a)pyrene and 582 yd^3 dieldrin] contaminated soil. The locations of the soil borings containing the exceedances of the COCs are presented in Figure 3-3. Details of the estimate for the contaminated soil are presented in Appendix C.

3.4.2 Volume of Groundwater

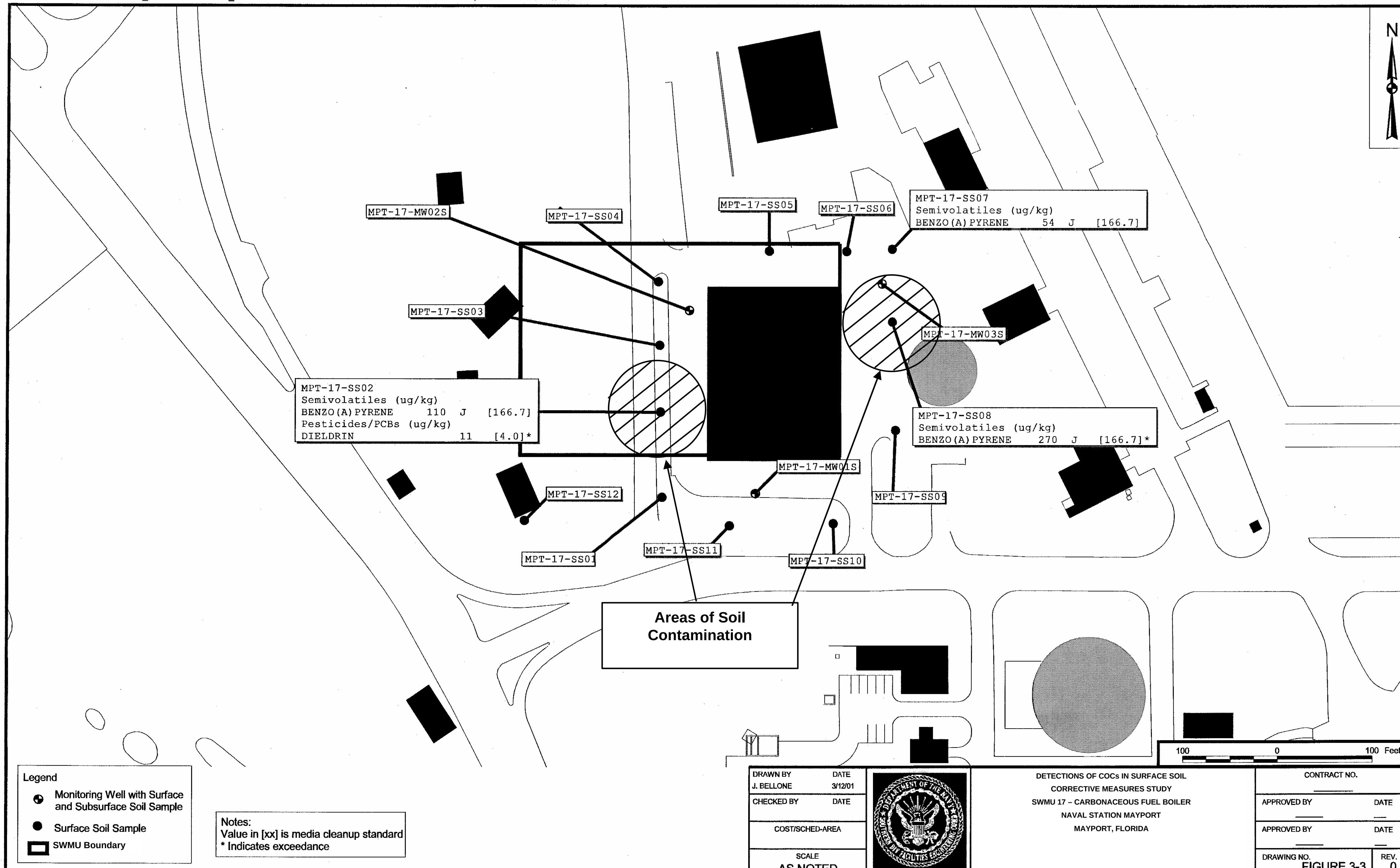
Based on the data collected during the RFI, plumes of inorganics within and near SWMU 17 were identified that exceeded the MCSs for the groundwater. For SWMU 17, the smaller area of ammonia contamination in groundwater is within the larger area of inorganic contamination. The areas and volumes of contaminated groundwater are based solely on human health risks because the groundwater at SWMU 17 was not considered as ecological concern as discussed in Section 3.1.4. Estimates of pore volume of these plumes resulted in approximately 9,700,000 gallons of metal (iron and manganese) contaminated groundwater and 1,900,000 gallons of ammonia contaminated groundwater. The volume estimate was made using a plume depth of 42 feet. Estimated area of contamination is approximately 87,800 ft^2 for metals (iron and manganese) and 17,400 ft^2 for ammonia. For SWMU 17, the smaller area of metal contamination in groundwater is within the larger area of ammonia contamination. The locations of wells containing the exceedances of the COCs is presented in Figure 3-4. Details of the estimates for volume of contaminated groundwater are presented in Appendix C.

3.4.3 Post-Draft CMS Groundwater Monitoring Data

Groundwater samples were collected from three monitoring wells (MPT-17-MW01S, MPT-17-MW02S, and MPT-17-MW03S) at SWMU 17 on August 15, 2001. The groundwater data are used to verify that the COCs selected during the draft CMS were appropriate and protective for current and future receptors at the SWMU.

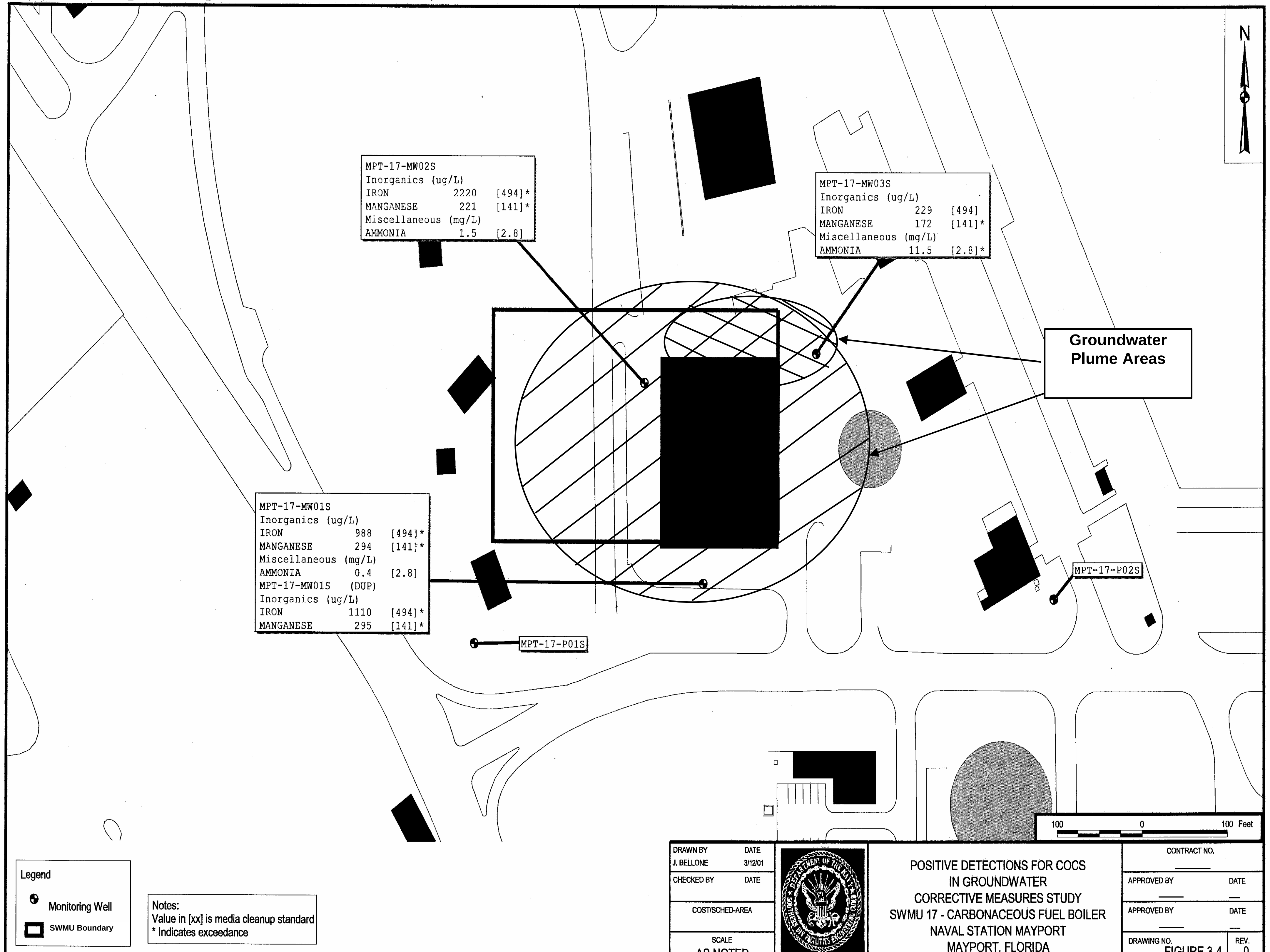
Table 3-17 presents a comparison of the post-CMS data to the draft CMS data. New maximum concentrations were detected for ammonia as nitrogen and iron. The detection of all of these chemicals is consistent with the contaminant sources and types previously identified. The new maximum concentrations were similar to previous maximum concentrations.

P:\GIS\MAYPORT\SWMU12-17_CMS3.APR\FIG 3-3_POSITIVE DETECTIONS FOR COCS IN SURFACE SOIL, SWMU 17 JCB 3/27/01



DRAWN BY J. BELLONE	DATE 3/12/01		DETECTIONS OF COCs IN SURFACE SOIL CORRECTIVE MEASURES STUDY SWMU 17 – CARBONACEOUS FUEL BOILER NAVAL STATION MAYPORT MAYPORT, FLORIDA	CONTRACT NO.
CHECKED BY	DATE			APPROVED BY / DATE
COST/SCHED-AREA				APPROVED BY / DATE
SCALE AS NOTED				DRAWING NO. FIGURE 3-3 / REV. 0

P:\GIS\MAYPORT\SWMU12-17_CMS3.APR\FIG 3-4_POSITIVE DETECTIONS FOR COCS IN GROUNDWATER, SWMU 17 JCB 3/13/01



DRAWN BY J. BELLONE DATE 3/12/01		POSITIVE DETECTIONS FOR COCS IN GROUNDWATER CORRECTIVE MEASURES STUDY SWMU 17 - CARBONACEOUS FUEL BOILER NAVAL STATION MAYPORT MAYPORT, FLORIDA	CONTRACT NO.	
CHECKED BY DATE			APPROVED BY DATE	
COST/SCHED-AREA			APPROVED BY DATE	
SCALE AS NOTED			DRAWING NO. FIGURE 3-4	REV. 0

TABLE 3-17

**SWMU 17, POST-DRAFT CMS GROUNDWATER SAMPLING DATA
NAVSTA MAYPORT, FLORIDA**

Monitoring Well ID	COC from CMS	CMS Concentration	MCS	08/15/01 Sampling Event Concentration	Still COC
MPT-17-MW01S	Iron	988	494	4,000	**Yes**
	Manganese	294	141	92.7	No
MPT-17-MW02S	Iron	2,220	494	2,000	**Yes**
	Manganese	221	141	45.2	No
MPT-17-MW03S	Manganese	172	141	193	**Yes**
	Ammonia	11,500	2,800	14,500	**Yes**

Note:
All concentrations reported in micrograms per liter (ug/L).

The evaluation of the new groundwater data shows that the concentrations of the chemicals in groundwater have fluctuated, but that the list of COPCs is similar. Because the new groundwater data concentrations and plume stabilization have occurred, the new groundwater data do not change the nature and extent of contamination. Therefore, the data presented in the draft CMS are acceptable for use in the final CMS.

3.5 IDENTIFICATION AND SCREENING OF CORRECTIVE MEASURES TECHNOLOGIES

The purpose of this section is to identify and screen appropriate technologies for corrective measure alternatives addressing the CAOs identified for SWMU 17. Each technology is then screened based on site and contaminant characteristics.

Table 3-18 presents the soil corrective measures technologies that are potentially applicable for addressing the CAOs. This table also presents the results of the screening of those technologies. The technology screening process reduces the number of potentially applicable technologies by evaluating the applicability of each technology to site and contaminant factors. Technologies deemed ineffective or not implementable were eliminated from further consideration.

Table 3-19 presents the groundwater corrective measures technologies that are potentially applicable for addressing the CAOs for SWMU 17. This table also presents the results of the screening of those technologies. The technology screening process reduces the number of potentially applicable technologies by evaluating the applicability of each technology to site and contaminant factors. Technologies deemed ineffective or not implementable were eliminated from further consideration.

TABLE 3-18

SWMU 17, PRELIMINARY SCREENING of CORRECTIVE MEASURES TECHNOLOGIES FOR SOIL
NAVSTA MAYPORT, FLORIDA
PAGE 1 OF 3

General Corrective Action	Corrective Measures Technology	Technology	Description	General Screening Comments
No Action	No Action	None	No remedial actions taken.	Retained. Will be considered for baseline comparison and for areas that have not experienced any releases of hazardous substances or for areas determined to have minimal short-term or long-term effects on soil, air, and groundwater quality.
Institutional Controls	Access Restrictions	Land Use Controls (LUCs)	LUCs for property in area would include restrictions on excavation/construction or future land and groundwater use.	Retained. LUCs are viable and will be considered where no active corrective measures are required and/or in combination with any technology where contaminants exceeding CMS objectives remain in place.
		Fencing	Construction of a fence to limit access to the site.	Retained. Will be applied to areas where special restrictions are required.
Monitoring	Monitoring	Monitoring	Monitoring the effectiveness of corrective action including downgradient groundwater monitoring.	Retained
Containment	Capping	Soil	Use of soil to provide a physical barrier to limit erosion and to promote growth of vegetative cover.	Retained. In general capping would be successful in preventing exposure to contaminated material and reducing infiltration of precipitation.
		Clay	Use of a compacted clay layer over contaminated areas to reduce infiltration and provide a physical barrier.	Retained
		Asphalt	Application of an asphalt layer over contaminated areas to prevent infiltration and provide a physical barrier.	Retained
		Concrete	Installation of concrete slabs over contaminated areas to prevent infiltration and provide a physical barrier.	Retained
		Synthetic Membrane	Use of a synthetic membrane (polyethylene, etc.) over contaminated areas to prevent infiltration and provide a physical barrier.	Retained
	Underground Barriers	Vertical Walls	Vertical slurry walls, grout curtains, sheet piles, or concrete walls around contaminated soil.	Eliminated. There is no confining layer at a reasonable depth for keying in.
Removal	Excavation	Trackhoe/Front End Loader	Remove contaminated soil for ex situ treatment and/or disposal.	Retained to excavate the contaminated soil.

TABLE 3-18

SWMU 17, PRELIMINARY SCREENING OF CORRECTIVE MEASURES TECHNOLOGIES FOR SOIL
NAVSTA MAYPORT, FLORIDA
PAGE 2 OF 3

General Corrective Action	Corrective Measures Technology	Technology	Description	Screening Comments
In Situ Treatment	Bioremediation	Aerobic Biodegradation	Degradation of organics using microorganisms in an oxygen-enriched environment.	Eliminated. Bioaugmentation studies on soil prove that the technology is not effective. Aerobic treatment is not effective in addressing pesticides.
		Anaerobic Biodegradation	Degradation of organics using microorganisms in an oxygen-deficient environment.	Eliminated. Bioaugmentation studies on soil proved that the technology is not effective.
		Bioventing	Bioremediation in which air is injected through wells to the subsurface to supply oxygen and increase biodegradation.	Retained as the technology would be effective for the remediation of benzo(a)pyrene and may remove low concentrations of dieldrin.
	Thermal	In Situ Vitrification (ISV)	In-place heating of the soil by electrodes to convert soil to chemically inert and stable glass-like obsidian or crystalline material.	Eliminated. Not practicable due to shallowness of water table.
	Physical/ Chemical	Soil Flushing	Spray application of water or aqueous solutions upgradient to flush contaminants through the soil to downgradient wells or trenches for collection.	Eliminated because of limited effectiveness on pesticides and benzo(a)pyrene which are relatively insoluble in water.
		Vapor Extraction (Vacuum extraction)	Uses an induced vacuum created by an extraction/injection well system around the contaminated area to desorb, transport, and collect volatile contaminants in the vadose (unsaturated) zone.	Eliminated because there are no volatile contaminants.
		Aeration	Surface tilling of soil to volatilize organics.	Eliminated because there are no volatile contaminants.
		Photolysis (photodegradation)	Uses Ultraviolet (UV) radiation (light energy) to break chemical bonds.	Eliminated because of limited effectiveness on pesticides.
		Chemical Stabilization/Fixation	To chemically bind the contaminants and prevent them from leaching.	Retained. The technology is effective for the immobilization of the low concentrations of benzo(a)pyrene and dieldrin.
Ex Situ Treatment	Bioremediation	Aerobic Biodegradation	Degradation of organics using microorganisms in an oxygen-enriched environment. Includes slurry phase (mixing of soil with water in a vessel) and solid phase (treatment bed or land farming) processes.	Eliminated. Bioaugmentation studies on soil prove that the technology is not effective. Aerobic treatment is not effective in addressing pesticides.

TABLE 3-18

SWMU 17, PRELIMINARY SCREENING OF CORRECTIVE MEASURES TECHNOLOGIES FOR SOIL
NAVSTA MAYPORT, FLORIDA
PAGE 3 OF 3

General Corrective Action	Corrective Measures Technology	Technology	Description	Screening Comments
Ex Situ Treatment (continued)	Anaerobic Biodegradation	Anaerobic Biodegradation	Degradation of organics using microorganisms in an oxygen-deficient environment. Includes slurry phase (mixing of soil with water in a vessel) and solid phase (treatment bed or land farming) processes.	Eliminated. Bioaugmentation studies on soil proved that the technology is not effective.
	Thermal	Incineration	Heating of the soil to a high temperature in an enclosed, controlled reactor to destroy organic contaminants. Includes rotary kiln, wet air oxidation, or fluidized/circulating bed processes.	Eliminated because of low level organic contamination present at the site. However, this treatment could be used at a TSDF if deemed appropriate.
	Physical/ Chemical	Soil Washing	Desorption of contaminants using mechanical action and water based fluids such as water, aqueous surfactants, and acids.	Eliminated because of limited effectiveness on pesticides and benzo(a)pyrene which are relatively insoluble in water.
		Aeration	After excavation, soil are placed on an impermeable surface and tilled to volatilize organics.	Eliminated because of low vapor pressure of contaminants.
		Chemical Stabilization/ Fixation	To chemically bind the contaminants and prevent them from leaching.	Eliminated because it requires digging up and thorough mixing of contaminated soil with the fixation compounds which would disturb the rest of the site. Once the waste is removed from the site, it would be easy to dispose at a TSDF. The technology may be used at the TSDF before land disposal.
		Solvent Extraction	Organics are removed from the soil by introducing a solvent that will transfer the organic compounds (attached to the soil particles) to the solvent phase.	Eliminated because of low contamination at SWMU 17.
Disposal	Onsite Disposal	Backfill	Place treated soil back in place.	Eliminated because onsite landfills are not a viable option any more because of shallow groundwater.
	Offsite Disposal	Hazardous Waste Landfill	Double-lined and capped permanent disposal facility.	Retained
		Treatment/Storage/ Disposal Facility	Treatment, storage, and disposal of waste at a regulated TSDF.	Retained

TABLE 3-19

SWMU 17, PRELIMINARY SCREENING of CORRECTIVE MEASURES TECHNOLOGIES for GROUNDWATER
NAVSTA MAYPORT, FLORIDA
PAGE 1 OF 3

General Corrective Action	Corrective Measures Technology	Technology	Description	General Screening Comments
No Action	No Action	No Action	No remedial actions taken.	Retained. Will be considered for baseline comparison and for areas that have not experienced any releases of hazardous substances or for areas determined to have minimal short-term or long-term effects on groundwater quality.
Institutional Controls	Access Restrictions	Land Use Controls (LUCs)	Zoning regulations in the area of groundwater contamination would involve restrictions on groundwater use and installation of new wells.	Retained. LUCs are viable and will be considered where no active corrective measures are required due to limited contamination or no elaborate corrective measures warranted and/or in combination with any technology where contaminants exceeding CMS objectives remain in place.
		Fencing	Construction of a fence to limit access to the site.	Retained. Will be applied to areas where special restrictions are required.
Monitoring	Monitoring	Groundwater monitoring	Periodic monitoring of residential wells and monitoring wells in the area of potential groundwater contamination.	Retained. Groundwater monitoring is viable for assessing the effectiveness of natural processes, containment, or treatment measures during and following implementation of corrective measures.
Containment	Hydrodynamic Control	Extraction Wells	Control of plume migration by a system consisting of extraction of the contaminated groundwater.	Retained. Extraction wells placed on the downgradient edge may be used to prevent groundwater plume migration to new area.
		Collection Trench	Control of plume migration by a collection trench and extraction of the contaminated groundwater.	Retained. Collection trench placed on the downgradient edge may be used to prevent groundwater plume migration to new area.
	Subsurface Barriers	Slurry Wall	Trench around areas of contamination is filled with a soil (or cement) bentonite slurry to obstruct/divert the groundwater flow.	Eliminated. Lack of a confining layer at a reasonable depth.
		Grout Curtain	Pressure injection of grout in a regular pattern of drilled holes. Requires integration with confining layer to be effective.	Eliminated. Lack of a confining layer at a reasonable depth.
		Sheet Piling	Driving interconnecting lengths of steel into the ground to form a thin, impermeable barrier. Requires integration with confining layer to be effective.	Eliminated. Lack of a confining layer at a reasonable depth.
Removal	Extraction	Extraction Wells	Series of pumping wells to extract contaminated groundwater.	Retained. Collection wells are effective to address limited extent of contamination.
		Collection Trenches	Perforated pipe in trenches backfilled with porous media to collect groundwater. May include sumps and gravity drains.	Retained. Collection trenches are effective to address limited extent of contamination in shallow aquifers.

TABLE 3-19

SWMU 17, PRELIMINARY SCREENING OF CORRECTIVE MEASURES TECHNOLOGIES FOR GROUNDWATER
NAVSTA MAYPORT, FLORIDA
PAGE 2 OF 3

General Corrective Action	Corrective Measures Technology	Technology	Description	General Screening Comments
In Situ Treatment	Bioremediation	Aerobic	Degradation of organics using microorganisms in an oxygen-enriched environment.	Retained. The technology may be effective for the nitrification of ammonia.
		Anaerobic	Degradation of organics using microorganisms in an oxygen-deficient environment.	Retained. The technology may be effective for the denitrification of ammonia.
	Physical / Chemical	Air Sparging	Injection of air below the water table. Rising bubbles volatilize dissolved and adsorbed phase contaminants and transport them to the vadose where they are removed by a method of collection such as vapor extraction or by in situ aerobic degradation.	Eliminated. Air sparging along with vapor extraction/bioventing is not effective for the removal of metals or ammonia unless pH is elevated.
		Permeable Reactive Barriers (PRBs)	An in situ barrier composed of a permeable reactive material that reacts with the contaminants in the water, reducing their concentrations by physical and chemical processes.	Eliminated. Treatment is not effective for multiple metals.
Ex Situ treatment (Onsite)	Bioremediation	Aerobic	Degradation of organics using microorganisms in an oxygen-enriched environment.	Retained because the technology can be used for the nitrification of ammonia.
	Physical / Chemical	Precipitation	Conversion of heavy metals into insoluble solid forms through the addition of precipitating agents such as hydroxides and sulfides.	Eliminated. The technology is not effective for the low concentrations of metals.
		Air Stripping	Mixing large volumes of air with groundwater in a packed column or aerated basin to promote transfer of volatile organic compounds to air.	Retained. The technology can be used for pH adjustment (to about 10.0 SUs) and is very effective for the removal of ammonia and the oxidation/precipitation of iron.
		Steam Stripping	Mixing large volumes of steam with groundwater in a packed column or aerated basin to promote transfer of volatile organic compounds to air.	Eliminated because the technology is ineffective for metals.
		Flocculation/ Coagulation	Use of chemicals to neutralize surface charges and promote particle size growth.	Eliminated as a primary technology but may be used for the removal of suspended solids.
		Sedimentation	Settlement of the solids by gravity and skimming the water from the top.	Eliminated. The technology is not effective for the low concentrations of metals.
		Filtration	Removal of suspended solids or metals by passing contaminated water through a filter media.	Retained. Filtration on a natural zeolite material called "greensand" is effective for the removal of low concentrations of iron and manganese.

TABLE 3-19

SWMU 17, PRELIMINARY SCREENING OF CORRECTIVE MEASURES TECHNOLOGIES FOR GROUNDWATER
NAVSTA MAYPORT, FLORIDA
PAGE 3 OF 3

General Corrective Action	Corrective Measures Technology	Technology	Description	Screening Comments
Ex Situ treatment (Onsite) –(cont.)	Physical / Chemical	Adsorption	Adsorption of contaminants onto activated carbon by passing water through carbon column.	Retained. The technology has shown some promise for the adsorption of ammonia and is a fairly well proven means of removing low concentrations of dissolved metals.
		Oxidation	Chemical oxidation (increase in oxidation state) of contaminants into less toxic or soluble forms through the use of oxidizing agent(s). Includes ozone, UV light, peroxide, permanganate, and manganese oxidation.	Retained. The technology is effective for the nitrification of ammonia and the oxidation and precipitation of iron.
Disposal	Surface Discharge	Direct to local stream	Treated groundwater discharged to local streams.	Retained. Permitted discharge can be made to a flowing local surface water body.
		Discharge to local treatment facility	Treated groundwater discharged to local Publicly Owned Treatment Works (POTW).	Retained. Permitted discharge can be made to address certain contaminants such as ammonia.
	Subsurface Discharge	Injection wells	Series of injection wells to discharge collected/treated groundwater to subsurface. Requires regulatory approval.	Eliminated. Reinjection of untreated groundwater is not a viable option. Reinjection of treated water may be appropriate.

3.6 DEVELOPMENT OF CORRECTIVE MEASURES ALTERNATIVES

The technologies that passed the preliminary screening are selected to represent a typical general corrective action and are assembled into alternatives representing a range of treatment and containment combinations, as appropriate. The purpose of providing a range of alternatives is to ensure all reasonable general corrective actions are represented and evaluated. The technologies that are selected to represent various alternatives for soil and groundwater are presented in Tables 3-20 and 3-22, respectively. The assembly of these technologies into alternatives for soil and groundwater are presented in Tables 3-21 and 3-23, respectively.

3.7 EVALUATION OF CORRECTIVE MEASURE ALTERNATIVES

The identified corrective measures alternatives were evaluated using the criteria contained in the *RCRA Corrective Action Plan, Final* (USEPA, 1994) as listed below.

1. Protect human health and the environment.
2. Attain MCSs set by the implementing agency.
3. Control the source of releases so as to reduce or eliminate, to the extent practicable, further releases that may pose a threat to human health and the environment.
4. Comply with any applicable standards for management of wastes.
5. Other factors.

The criteria and elements for the above standards to be used for the detailed analysis of alternatives are described in Section 2.7.

3.8 CORRECTIVE MEASURES ALTERNATIVES FOR SOIL

The corrective measure for soil at SWMU 17 is to address 7,850 yd^3 of benzo(a)pyrene and 7,850 yd^3 of dieldrin contaminated surface soil. The concern for benzo(a)pyrene in surface soil is direct contact to industrial workers. The concern for dieldrin in surface soil is leaching to groundwater but was not found to be COC in groundwater. Four alternatives were developed to address soil contamination at SWMU 17. The alternatives are as follows:

Soil Alternative 1: No Action
Soil Alternative 2: LUCs and Site Monitoring
Soil Alternative 3: Capping, LUCs, and Site Monitoring
Soil Alternative 4: Surface Soil Excavation, Offsite Disposal, and LUCs

TABLE 3-20

SWMU 17, REPRESENTATIVE SOIL CORRECTIVE MEASURES TECHNOLOGIES NAVSTA MAYPORT, FLORIDA

General Corrective Action	Corrective Measures Technology	Technology	Representative Technology	Rationale
No Action	No Action	• None	None	Required
Institutional Controls	Access Restrictions	• LUCs • Fencing	LUCs	LUCs offer broader controls
Monitoring	Monitoring	• Monitoring	Monitoring	Required
Containment	Capping	• Soil cover • Clay capping • Asphalt capping • Synthetic membrane • Concrete capping	Asphalt capping	Relatively easy to install and equally effective for controlling infiltration
Removal	Excavation	• Trackhoe	Trackhoe	To excavate the contaminated soil
In Situ Treatment	Bioremediation	• Aerobic Biodegradation • Bioventing	Not considered	Overall effectiveness will be low [(a)].
	Physical/ Chemical	• Chemical Stabilization/ Fixation	Not considered	Because the soil COCs are not found in groundwater.
Disposal	Offsite Disposal	• Hazardous waste landfill • TSDF	TSDF	Excavated waste may need treatment prior to disposal to meet LDRs

(a) The technology is fairly effective for all COCs or is effective for certain contaminants only. Several combinations of treatment technologies may be required to treat all the COCs at the site, which may not be cost-effective.

TABLE 3-21

SWMU 17, ASSEMBLY OF SOIL ALTERNATIVES NAVSTA MAYPORT, FLORIDA

Alternative	Alternative Type	Representative Process Options Combined Into Alternatives	Alternative Description
Alternative 1: No Action	No Action	None	No Action.
Alternative 2: Land Use Controls and Site Monitoring	Containment/ Limited Action – No or Limited Treatment	LUCs and Monitoring	• LUCs • Posting of warning signs. • Five-year site reviews (for 30 years). • LUC Monitoring (for 30 years).
Alternative 3: Capping, Land Use Controls, and Site Monitoring	Containment/ Limited Action – No or Limited Treatment	LUCs, Monitoring, and Asphalt Cover	• LUCs • Place and maintain asphalt cover in the uncovered hot spot areas. • Posting of warning signs. • Five-year site reviews (for 30 years). • LUC Monitoring (for 30 years).
Alternative 4: Surface Soil Excavation, Offsite Disposal, and Land Use Controls	Treatment/Bulk Removal – Minimizes Long-Term Management	LUCs, Trackhoe, and TSDF	• LUCs. • Excavation of contaminated soil using trackhoe and disposal at TSDF. • Backfill excavation with clean fill. • Establish vegetative cover. • Posting of warning signs. • Five-year site review (first five years). • LUC Monitoring (for 30 years).

TABLE 3-22

SWMU 17, REPRESENTATIVE GROUNDWATER CORRECTIVE MEASURES TECHNOLOGIES NAVSTA MAYPORT, FLORIDA

General Corrective Action	Corrective Measures Technology	Technology	Representative Technology	Rationale
No Action	No Action	No Action	No Action	Required
Institutional Controls	Access Restrictions	• LUCs • Fencing	LUCs	To impose water and residential use restrictions
Monitoring	Monitoring	• Monitoring	Monitoring	Required
Containment/Removal	Extraction	• Extraction Wells • Collection Trench	Extraction Wells	Due to limited contamination
In Situ Treatment	Bioremediation	• Aerobic	Not Considered	The technology is not effective for metals[(a)].
Ex Situ Treatment (onsite)	Physical/Chemical	• Air Stripping(a) • Filtration • Adsorption(a) • Oxidation(a)	Greensand Filtration	Very effective for iron and manganese removal.
Disposal	Surface Discharge	• Direct to local stream • Discharge to local treatment facility	Discharge to POTW	To address contaminants such as ammonia.

(a) The technology is fairly effective for all COCs or is effective for certain contaminants only. Several combinations of treatment technologies may be required to treat all the COCs at the site, which may not be cost-effective.

TABLE 3-23

SWMU 17, ASSEMBLY OF GROUNDWATER ALTERNATIVES NAVSTA MAYPORT, FLORIDA

Alternative	Alternative Type	Representative Technologies Combined Into Alternatives	Alternative Description
Alternative 1: No Action	No Action	None	• No action.
Alternative 2: Monitored Natural Attenuation, Land Use Controls and Site Monitoring	Containment/ Limited Action – No or Limited Treatment	LUCs and Monitoring	• LUCs • Posting of warning signs. • Installing monitoring wells. • Periodic groundwater sampling to monitor groundwater contamination. • Five-year site reviews for 30 years • LUC Monitoring (for 30 years).
Alternative 3: Groundwater Extraction, Ex Situ Treatment, Surface Discharge, Land Use Controls, and Site Monitoring.	Treatment/ Addresses the Principal Threats	LUCs, Installation of Additional Monitoring Wells, Extraction Wells, Filtration, Discharge to local POTW, and Monitoring.	• LUCs. • Posting of warning signs. • Installing monitoring wells. • Installing extraction wells to collect groundwater. • Treatment of groundwater using greensand filtration. • Discharge of treated water to a local POTW • Periodic groundwater and treated water sampling to monitor the progress of treatment. • Five-year site reviews (first five years) • LUC Monitoring (for 30 years).

3.8.1 Soil Alternative 1: No Action

The No Action alternative serves as a baseline consideration or addresses sites that do not require active remediation. This alternative assumes that no corrective action would occur. No LUCs would remain or be implemented. There would be no monitoring of conditions. Natural attenuation might eventually reduce low concentrations of contaminants to acceptable levels, but the progress of attenuation would not be monitored.

3.8.2 Soil Alternative 2: LUCs and Site Monitoring

Alternative 2 would be of the limited action type. LUCs are rules, directives, policies, and other measures (e.g., fencing and warning signs) adopted by the appropriate authorities in a manner consistent with applicable Federal, State, and local laws. Land use at SWMU 17 is to remain industrial. LUCs would be implemented in the form of a soil disturbance prohibition.

The implemented LUC would serve to both protect human health by precluding exposure to contamination and also serve to prevent contaminant migration to other areas of the base. LUCs are imposed on areas that exceed residential standards. Contaminants that exceed residential standards are arsenic, benzo(a)anthrancene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, 4,4'-DDE, and dieldrin, in surface soil (see Appendix B). LUC implementation would occur via preparation of a site-specific LUCIP which will describe the site location, the prohibition itself, its objectives, and other pertinent information. Once implemented, LUC oversight would be covered under the LUC MOA executed between FDEP, USEPA, and NAVSTA Mayport which provides for certain periodic site inspection and reporting requirements.

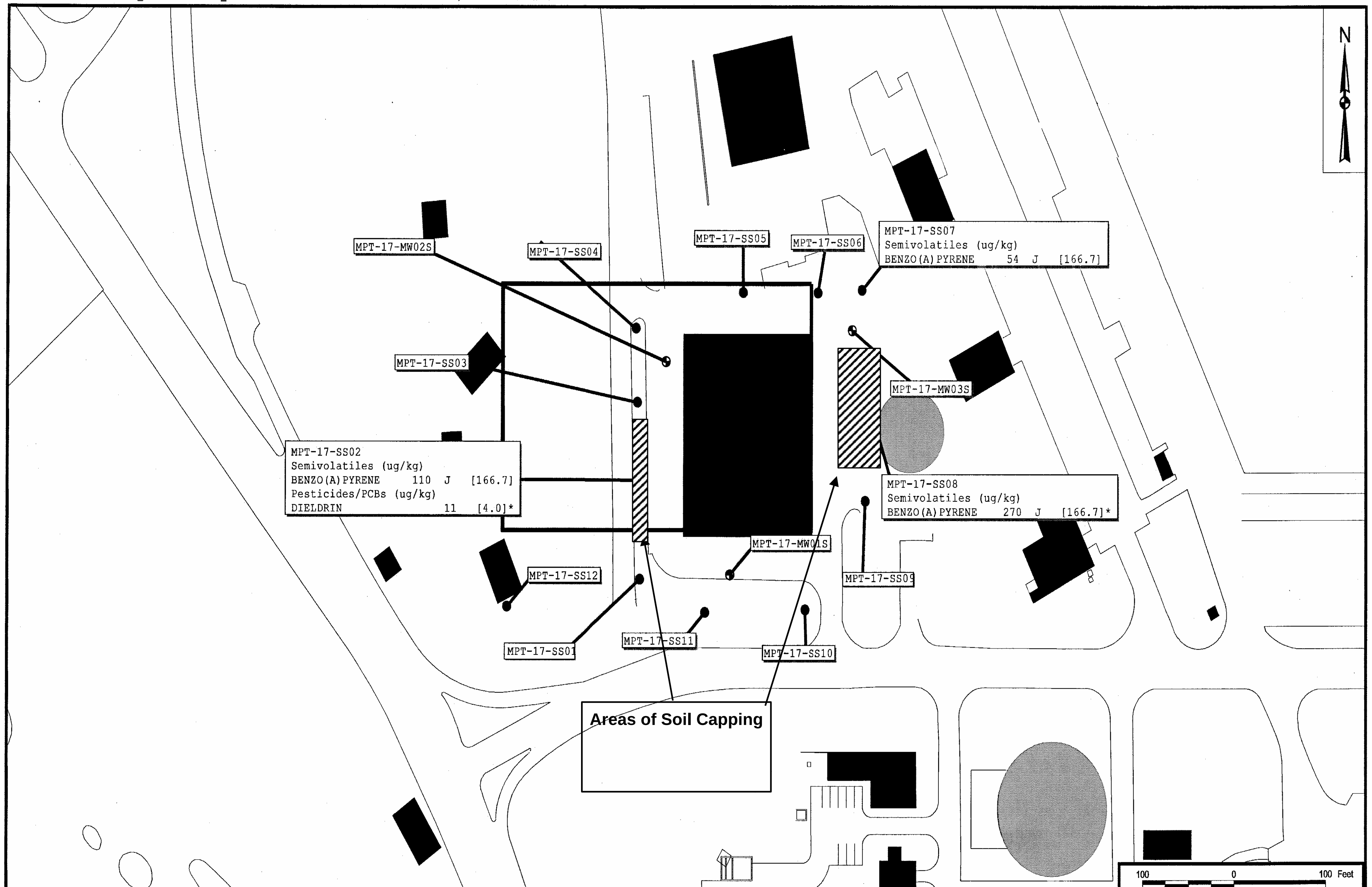
3.8.3 Soil Alternative 3: Capping, LUCs, and Site Monitoring

Alternative 3 would address the principal threats posed by contaminated soil through an impermeable cover over the uncovered hot spots shown in Figure 3-5, which protects from direct contact and prevents infiltration reducing the potential of contaminants to leach into the underlying aquifer matrix. The effectiveness of the technique has been demonstrated in full-scale operations.

LUCs are described in Section 3.8.2. Monitoring would consist of ensuring that LUCs remain in place, existing and new asphalt cover remains intact, and periodic sampling and analysis of downgradient wells to assess groundwater quality occur. Approximately nine wells would be sampled on a quarterly basis.

The site is mostly paved except for a few hot spot areas that would be paved under this alternative. The asphalt cover (approximately 6,500 ft^2 required east of Building 1430 and 1,500 ft^2 required west of

P:\GIS\MAYPORT\SWMU12-17_CMS3.APR\FIG 3-3_POSITIVE DETECTIONS FOR COCS IN SURFACE SOIL, SWMU 17 JCB 3/27/01



DRAWN BY	DATE	SOIL ALTERNATIVE 3 CORRECTIVE ACTION	CONTRACT NO.	
J. BELLONE	3/12/01	CORRECTIVE MEASURES STUDY SWMU 17 – CARBONACEOUS FUEL BOILER NAVAL STATION MAYPORT MAYPORT, FLORIDA		
CHECKED BY	DATE		APPROVED BY	DATE
COST/SCHED-AREA			APPROVED BY	DATE
SCALE AS NOTED			DRAWING NO. Figure 3-5	REV. 0

Building 1430 as shown in Figure 3-5) would act as a water-resisting and impermeable layer providing protection against potential infiltration. The asphalt cap would be approximately 4 inches thick with a 4-inch gravel bedding layer.

Five-year site reviews would consist of evaluating the monitoring data for effectiveness of the corrective measure and LUCs.

3.8.4 Soil Alternative 4: Surface Soil Excavation, Offsite Disposal, and LUCs

Alternative 4 would minimize long-term management by addressing contaminated soil through excavation and disposal. This alternative would offer aggressive remediation through excavation and transportation of contaminated soil to a hazardous waste landfill. An estimated 1,165 yd^3 (approximately 1,600 tons) of soil would be excavated for disposal.

Removal would involve excavation of surface soil that exceeds the industrial MCSs to a depth of 2 feet bgs. Excavated material would be loaded onto trucks and transported offsite to an approved TSDF. The effectiveness of the technique has been demonstrated in many full-scale operations. Excavated areas would be promptly backfilled with clean fill material and graded to match site contours.

TSDFs are controlled by regulations contained in, but not limited to, 40 *Code of Federal Regulations* (CFR) 264 and 265. LDRs would be followed. It is not practical to select a specified TSDF or transporter at this time; however, potential TSDFs are available in Florida or neighboring states. The TSDFs and transporters would be from an approved list of USEPA- and/or FDEP-registered vendors.

Dust suppression, air monitoring, run-on/runoff controls, and other erosion and sedimentation controls, as necessary for the protection of human health and the environment, would be conducted during remedial activities onsite.

LUCs are described in Section 3.8.2. Monitoring would consist of ensuring that LUCs remain in place and periodic sampling and analysis of downgradient wells to assess groundwater quality occur. Approximately nine wells would be sampled on a quarterly basis.

Five-year site reviews would consist of evaluating the monitoring data for effectiveness of the corrective measure and LUCs.

3.9 EVALUATION OF SOIL CORRECTIVE MEASURE ALTERNATIVES

The identified Corrective Measure Alternatives for soil are evaluated using the criteria described in Section 2.7.

3.9.1 Soil Alternative 1: No Action

Protect Human Health and the Environment

No Action would allow unacceptable risks to human health and the environment. The No Action alternative would do nothing to effectively isolate contaminant sources or reduce continued leaching, resulting in continued contamination of groundwater.

Attain Media Cleanup Standards

No Action would not attain the MCSs in a reasonable period of time. Natural processes might eventually reduce low concentrations of contaminants to acceptable levels, but the progress of the natural processes would not be monitored.

Control the Source of Releases

No Action would not control or eliminate the source of contamination. Natural processes might eventually eliminate the source; however, the progress of the natural processes would not be monitored.

Comply with any Applicable Standards for Management of Wastes

No Action would not involve any waste management activities and, therefore, no standards for management of wastes would apply.

Other Factors

a. Long-Term Reliability and Effectiveness

The No Action alternative would not provide long-term reliability and effectiveness at SWMU 17. Contaminants could continue to leach and migrate and might pose a long-term risk to human health and the environment. Aside from natural processes, this alternative would offer no reduction in risk over long periods of time.

b. Reduction in the Toxicity, Mobility, or Volume of Wastes

Soil with contaminant concentrations above MCSs would remain onsite. No Action would allow unacceptable risks to human health and the environment. Reduction of toxicity, mobility, or volume might occur but only through natural processes. Natural biodegradation would not be documented in the absence of monitoring, and contaminants could leach to groundwater and migrate offsite.

c. Short-Term Effectiveness

The No Action alternative would not include any construction or remedial implementation, so there would be no short-term risks to workers, the community, or the environment. Neither the public nor the workers would be exposed to potential threats associated with construction or transportation.

d. Implementability

No technical implementability issues would exist because no corrective action would occur. There would be no administrative issues and no need to coordinate with other agencies or acquire permits. Future remedial actions, if needed, would not be hindered by the No Action alternative.

e. Cost

No corrective action would occur; therefore, there would be no capital costs. The only cost associated with the No Action alternative is the cost for 5-year reviews. The estimated present worth total project cost is $18,000 including $7,375 every 5 years for reviews.

3.9.2 Soil Alternative 2: LUCs and Site Monitoring

Protect Human Health and the Environment

LUCs would effectively minimize direct human contact with contaminated soil by limiting activities at the site and restricting access to the site. Soil with contaminant concentrations above MCSs would remain in place. LUCs would minimize direct human exposure to contaminated soil by controlling site access and use. Soil contaminants would continue to leach to the groundwater. Monitoring would assess the groundwater quality and make sure that restrictions on land use and groundwater wells are in place. LUCs would not reduce the potential soil migration pathway and the groundwater migration pathway. Recent groundwater sampling data show that natural attenuation is reducing the COC concentrations due to natural processes; however, some of the COCs do not readily degrade over time (see Appendix B).

Attain Media Cleanup Standards

Monitoring would not attain the MCSs in a reasonable period of time. Natural processes might eventually reduce low concentrations of contaminants to acceptable levels that would be indicated by the periodic monitoring.

Control the Source of Releases

LUCs and Site Monitoring would not control or eliminate the source of contamination. The existing concrete cap would control the erosion of the contaminated soil; however, the concrete does not cover all areas exceeding the MCSs. Natural processes might eventually eliminate the source.

Comply with Any Applicable Standards for Management of Wastes

LUCs would not involve any waste management activities and, therefore, no standards for management of wastes would apply. Any waste produced during the installation of new monitoring wells would be disposed of following applicable Federal, State, and local regulations.

Other Factors

a. Long-Term Reliability and Effectiveness

Monitoring would provide no long-term effectiveness or permanence at SWMU 17. COCs could continue to leach and migrate in the areas currently not covered and might pose a long-term risk to human health and the environment. LUCs would prevent exposure. Natural processes would offer reduction in risk over long periods of time, the progress of which would be monitored. Long-term management would consist of LUCs and site monitoring and would be expected to last 30 years.

b. Reduction in the Toxicity, Mobility, or Volume of Wastes

Soil with COC concentrations above MCSs would remain onsite. LUCs would prevent unacceptable risks to human health; however, elevated concentrations would exist in the environment. Reduction of toxicity, mobility, or volume might occur but only through natural processes. Natural processes would be documented through monitoring; however, COCs could leach to groundwater and migrate off base.

c. Short-Term Effectiveness

The alternative would involve the installation of monitoring wells. The short-term risks to workers and the environment would be manageable using the appropriate engineering and construction controls. As there are no nearby communities, exposures to the community from the contaminants are unlikely to occur. Implementation of this alternative would not pose any safety concerns to nearby communities, the environment, or onsite workers with the use of appropriate engineering and construction management controls. Sampling of groundwater might expose workers to hazardous substances. Exposure to workers during sampling would be minimal and could be controlled by the use of appropriate PPE.

d. Implementability

Alternative 2 would be readily implementable. Monitoring wells could be readily installed. Limited manpower and materials would be available to install the monitoring wells. Monitoring requires periodic sampling. This alternative should take less than one year to implement. Permits for installing monitoring wells might be required. Administrative issues and coordination with other agencies or acquiring permits are easily achievable. Future remedial actions, if needed, would not be hindered by this alternative.

e. Cost

Cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of the estimates. The estimated capital cost for Soil Alternative 2 would be $24,000. The annual O&M costs would be $3,700. Present worth cost over a period of 30 years would be $85,000. Groundwater monitoring costs are considered as part of the groundwater alternatives. Detailed cost estimates are provided in Appendix D.

3.9.3 Soil Alternative 3: Capping, LUCs, and Site Monitoring

Protect Human Health and the Environment

This alternative would add additional protection to Soil Alternative 2 by constructing an asphalt cover over the uncovered contaminated surface soil as shown in Figure 3-5. Aspects of LUCs and Site Monitoring are presented in Section 3.9.2. Capping would effectively prevent direct human or ecological contact with contaminated soil by covering the contaminated areas at the site and preventing infiltration that could cause dieldrin migration to groundwater. Soil with contaminant concentrations above MCSs would remain in place; however, further leaching of contaminants into groundwater would be eliminated. In the long term, contaminated soil would not migrate to other locations. Monitoring would be used to assess the groundwater quality and make sure that restrictions on land use and groundwater wells are in place. Contaminant concentrations would be reduced over time due to the elimination of further leaching. Natural processes would also help reduce the concentrations of some contaminants.

Attain Media Cleanup Standards

Capping would not actively reduce the concentrations of COCs, but would prevent the pathways for exposure and prevent further leaching of the contaminants into the groundwater. Natural processes might eventually reduce low concentrations of contaminants to acceptable levels, which would be indicated by the monitoring.

Control the Source of Release

Capping would control the source of contamination from further leaching resulting from rainwater infiltration. Natural attenuation might eventually eliminate the source.

Comply with any Applicable Standards for Management of Wastes

Any waste generated during the construction of the cap and new monitoring wells would be properly disposed of following all applicable Federal, State, and local regulations. Generation of wastes subject to land disposal restrictions would not be anticipated.

Other Factors

a. Long-Term Reliability and Effectiveness

Capping would provide long-term reliability and effectiveness at SWMU 17. Capping has been used extensively and effectively to prevent direct contact and infiltration at various sites. As the contaminants' ability to leach and migrate would be limited, the long-term risk to human health and the environment would be minimal. Capping and LUCs would prevent any potential direct exposure. Natural processes would offer further reduction in risk over long periods of time, the progress of which would be monitored.

b. Reduction in the Toxicity, Mobility, or Volume of Wastes

Soil with contaminant concentrations above MCSs would remain onsite. The cap would reduce the mobility of contaminants. Reduction of toxicity or volume might occur, but only through natural processes and would be documented through monitoring.

c. Short-Term Effectiveness

Alternative 3 would involve the construction of the cap at the site and installation of monitoring wells. The short-term risks to workers and the environment would be manageable using the appropriate engineering and construction controls. As there are no nearby communities, exposures to the community from the contaminants are unlikely to occur. Implementation of this alternative would not pose any safety concerns to nearby communities, the environment, or onsite workers with the use of appropriate engineering and construction management controls.

Dust suppression to control potential fugitive dust emissions and air monitoring would be used as necessary to ensure worker safety during remedial activities at the site. Limited O&M would be required for the cap, and no exposure to workers would be anticipated. Exposure to workers during sampling would be minimal and could be controlled by the use of appropriate PPE.

d. Implementability

This alternative would be readily implementable. Capping and monitoring wells could be readily installed. Limited manpower and materials are necessary to install the cap and monitoring wells. Monitoring requires periodic sampling and inspection of the cap. Materials and labor are readily available for installing the cap and monitoring of wells as well as maintenance of the cap and periodic sampling. The design and installation of a cap are a standard construction practice. This alternative should take less than one year to implement. Permits for installing the cap and monitoring wells might be required. Administrative issues and coordination with other agencies or acquiring permits would be easily achievable. Future remedial actions such as extending the cap to new areas would not be hindered by this alternative; however, any remedial actions involving source removal would disturb the cap.

e. Cost

Cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of the estimates. The estimated capital cost for Soil Alternative 3 would be $104,000. The annual O&M costs would be $3,900. Present worth cost over a period of 30 years would be $168,000. Groundwater monitoring costs are considered as part of the groundwater alternatives. Detailed cost estimates are provided in Appendix D.

3.9.4 Soil Alternative 4: Surface Soil Excavation, Offsite Disposal, and LUCs

Protect Human Health and the Environment

Alternative 4 would remove the source areas and prevent potential migration of contaminants. Contaminated soil would be excavated and disposed offsite, and clean soil would be backfilled onsite. Soil with contaminant concentrations above MCSs would not remain onsite. Alternative 4 provides protection to human health and the environment by source removal and preventing further leaching to groundwater. No direct human contact with contaminated soil would occur after the corrective measures are implemented.

Attain Media Cleanup Standards

Excavation and disposal would attain the soil MCSs. The natural attenuation might eventually reduce any potential residual groundwater concentrations. The soil MCSs should be attainable in less than 1 year.

Control the Source of Releases

Excavation and disposal would eliminate the source of contamination and prevent further leaching that may pose a threat to human health and the environment. Confirmational sampling would ensure that all contaminated soil is removed.

Comply with Any Applicable Standards for Management of Wastes

Excavation of contaminated soil would generate waste, which would be transported to and disposed of in a licensed and approved offsite landfill following all Federal, State, and local regulations. Generation of wastes subject to LDRs is not anticipated.

Other Factors

a. Long-Term Reliability and Effectiveness

The alternative would involve excavation of contaminated soil and backfilling with clean soil. There would be no machinery or equipment at the site on a long-term basis. Soil removal using construction equipment such as backhoe would be reliable in addressing the contaminated media. Because the contaminated soil would effectively be removed and disposed of followed by backfilling with clean soil, the level of effectiveness would be very high.

b. Reduction in the Toxicity, Mobility, or Volume of Wastes

The reduction in the mobility would be close to 100 percent because the contaminated soil would be excavated from the site.

c. Short-Term Effectiveness

All contaminated soil would be excavated and properly disposed offsite in a permitted landfill and clean soil would be backfilled onsite. The short-term risks to onsite workers and the environment would be manageable using the appropriate engineering and construction controls. As there are no nearby communities, exposures to the community from the contaminants are unlikely to occur. Implementation of this alternative would not pose any safety concerns to nearby communities, the environment, or onsite workers with the use of appropriate engineering and construction management controls. Dust suppression to control potential fugitive dust emissions and air monitoring would be used as necessary to ensure worker safety during remedial activities at the site. Exposure to workers would be minimal and could be controlled by the use of appropriate PPE.

d. Implementability

This alternative would be implementable. Equipment and personnel to implement this alternative would be available. Excavation of soil is a standard construction practice but extra care would be required because of the contamination. The alternative is very reliable because the contaminated soil would be removed. This alternative should take less than one year to implement. Permits for excavation and disposal of contaminated soil would be required. Administrative issues and coordination with other agencies or acquiring permits are easily achievable. Future remedial actions such as excavating new areas would not be hindered by this alternative.

e. Cost

Cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of the estimates. The estimated capital cost for Soil Alternative 4 would be $704,000. The annual O&M costs would be $4,100. Present worth cost over a period of 30 years would be $761,000. Groundwater monitoring costs are considered as part of the groundwater alternatives. Detailed cost estimates are provided in Appendix D.

3.10 RECOMMENDATION FOR A FINAL SOIL CORRECTIVE MEASURES ALTERNATIVE

The recommendation for a final soil corrective measures alternative will be based on a comparative analysis of soil alternatives.

3.10.1 Comparative Analysis of Soil Alternatives

A comparative analysis of Soil Alternatives is presented to address how effectively each alternative will comply with the standards listed in the guidance (USEPA, 1994). Soil Alternative 1 (No Action) is considered for baseline purposes and is not expected to satisfy any of the requirements.

Protect Human Health and Environment

Soil Alternatives 2, 3, and 4 would all be effective in protecting human health and the environment to some extent. However, Alternative 2 would be least protective of human health as compared to Alternatives 3 and 4 would be relatively more effective compared to Alternative 2 because they would minimize or prevent altogether the future migration of COCs from soil to leach to groundwater. Alternative 1 would not be protective of human health or the environment. Alternatives 2 and 3 would require long-term monitoring to ensure their effectiveness. Alternative 3 would prevent potential direct exposure pathway. Alternatives 2 and 3 would provide a cap to prevent leaching of contaminants from soil to groundwater but Alternative 4 would remove the contaminated soil for disposal at another location, and clean backfill would be provided to fill the excavated areas. No soil with COCs exceeding MCSs would remain at SWMU 17 under Alternative 4.

Attain Media Cleanup Standards

Soil Alternative 4 would attain the soil MCSs within 6 months by removing source areas. Soil Alternatives 1, 2, and 3 may attain the same after a long period of time as they rely on natural processes.

Control the Source of Releases

Soil Alternative 4 would have the most effective source control because it would remove the source. Soil Alternative 3 would have a control in preventing leaching of contaminants into groundwater and would prevent erosion of the contaminated soil. Alternative 2 would not provide any source control. Alternatives 2 and 3 would depend on natural processes to degrade the source areas. Alternative 1 would not provide any control of the source of contamination.

Comply with any Applicable Standards for Management of Wastes

Soil Alternatives 1, 2, and 3 would not involve the generation/management of waste when implemented except for a small quantity during the construction of cover (for Alternative 3) and development of monitoring wells. Alternative 1 would not generate any waste. Soil Alternative 4 would generate the largest quantity of waste because of source removal. The waste generated in all alternatives would be disposed of at offsite facilities following all applicable Federal, State, and local requirements. None of the waste streams are expected to have LDRs.

Other Factors

a. Long-Term Reliability and Effectiveness

Soil Alternative 4 would have the highest long-term reliability and effectiveness because of source removal. Soil Alternatives 1, 2, and 3 would rely on natural processes in addressing the source. None of these alternatives would have any treatment system in-place. Alternative 3 would limit contaminant leaching into groundwater and has a higher reliability and effectiveness compared to Alternative 2. Alternative 1 would have the least long-term reliability and effectiveness.

b. Reduction in the Toxicity, Mobility, or Volume of Waste

Soil Alternative 4 would have the highest (almost 100 percent) reduction in the mobility of the contaminated soil due to the removal of source. Alternative 3 would have higher reduction in mobility compared to Alternative 2 because of the cap that prevents the infiltration of rainfall. Alternatives 1, 2, and 3 rely on natural processes for the reduction in toxicity and volume.

c. Short-Term Effectiveness

Alternative 2 requires the least construction activity, and Alternative 3 would require less construction activities compared to Alternative 4. Alternative 1 would not involve any construction activities. However, none of these alternatives would pose any threat to local communities or onsite personnel during the implementation of the corrective measures. Soil Alternative 4 could result in a risk from the potential spillage of contaminated soil during offsite transportation. Onsite workers would be protected from exposure to hazardous substances through appropriate use of PPE.

d. Implementability

All alternatives are readily implementable. The technologies involved and required services are easily available. Administrative issues and coordination with other agencies or acquiring permits are easily achievable. Future remedial actions would not be hindered by the alternative. Alternative 4 would take a longer time compared to the other alternatives in implementing the corrective measure; however, the time for beneficial results for this alternative would be much less compared to Alternatives 2 and 3. Alternative 4 involves the disposal of excavated soil; offsite TSDFs are available.

e. Cost

The estimated capital, O&M, and net present worth costs are presented in Table 3-24.

TABLE 3-24

SWMU 17, COSTS FOR SOIL ALTERNATIVES
NAVSTA MAYPORT, FLORIDA

Alternative	Capital Costs	Annual O&M Costs	Total Present Worth Costs*
1	$0	• $7,375 every 5 years	$18,000
2	$24,000	• $3,731 for 1-30 years • with an additional $6,704 every 5 years	$85,000
3	$104,000	• $3,928 for 1-30 years • with an additional $6,704 every 5 years	$168,000
4	$704,000	• $4,104 for 1-30 years • with an additional $7,375 at the 5th year	$761,000

Note:
*30-YEAR, 7% INTEREST RATE

3.10.2 Recommendation

Based on the screening of technologies and assessment of various alternatives performed, Soil Alternative 3 is recommended for addressing the soil contamination at SWMU 17.

3.11 DESCRIPTION OF THE RECOMMENDED SOIL CORRECTIVE MEASURES ALTERNATIVE

3.11.1 Summary of the Soil Corrective Measure and Rationale

a. Description of the Corrective Measure and Rationale for Selection

The recommended corrective measure alternative involves placing a cap on the remaining unpaved areas of SWMU 17 to provide a barrier and prevent direct exposure. The impermeable cap would minimize infiltration, thus minimizing contaminant leaching from soil to groundwater. Alternative 3 is moderately aggressive in addressing the contamination and provides the corrective measures in a reasonable amount of time. The asphalt cover (approximately 6,500 ft^2 required east of Building 1430 and 1,500 ft^2 required west of Building 1430) would act as a water-resisting and impermeable layer providing protection against potential infiltration. Benzo(a)pyrene in surface soil exceeded the MCS for direct contact to industrial workers. Benzo(a)pyrene was not detected in groundwater. Dieldrin exceeded the groundwater leaching-based criterion; however, there were no detections of dieldrin in groundwater. Although surface soil COCs are not a concern in groundwater, providing the asphalt cover in the uncovered contaminated areas would provide adequate and cost-effective protection of human health and the environment.

b. Performance Expectations

The recommended corrective measure alternative would prevent potential human exposure pathways and may achieve soil MCSs through natural processes over a period of time. Based on the RFI conclusions, there were no ecological impacts.

c. Preliminary Design Criteria and Rationale

In order to provide adequate groundwater monitoring, three additional monitoring wells would be installed at the downgradient locations. LUCs would be in place to prevent residential construction at the site and prevent groundwater usage. An asphalt cover over the uncovered contaminated areas would be constructed to prevent infiltration. Natural attenuation would eventually reduce source concentrations to meet FDEP standards.

d. General O&M Requirements

The cap would require routine inspection and maintenance for potential cracks.

e. Long-Term Monitoring Requirements

Groundwater monitoring would be conducted on a periodic basis for about 4 years to verify successful implementation of the corrective measures and, if required, monitoring would be continued up to 30 years along with LUCs.

3.11.2 Design and Implementation Precautions

a. Special Technical Problems

Placing capping is a common and well-established method to provide a barrier. No other technical problems are anticipated in implementing the corrective measures.

b. Additional Engineering Data Required

No additional engineering data are required.

c. Permits and Regulatory Requirements

Base permits would be needed for the construction of the cap and the installation of the monitoring wells. RCRA groundwater monitoring requirements have to be satisfied.

d. Health and Safety Requirements

OSHA requirements have to be satisfied during construction activities. Ambient air monitoring would be conducted and the surrounding community would be notified in case of an emergency.

e. Community Relations Activities

The selection of preferred corrective measures and details on how they would be implemented would be presented to the local community.

3.11.3 Cost Estimate and Schedule

a. Capital Cost Estimate

The capital costs involved in the implementation of the recommended corrective measure alternative are presented in Table 3-24.

b. O&M Cost Estimate

O&M costs for the recommended corrective measure alternative are presented in Table 3-24.

c. Project Schedule

Figure 3-6 presents the project schedule for the implementation of the recommended corrective measure alternative.

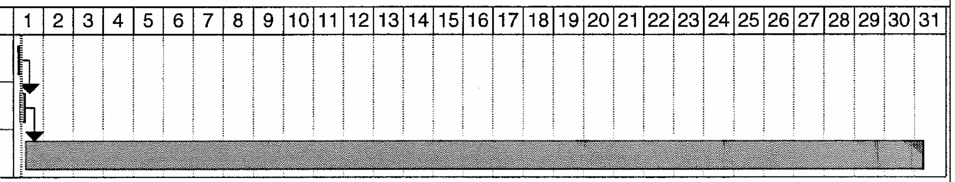
3.12 CORRECTIVE MEASURE ALTERNATIVES FOR GROUNDWATER

The corrective action for groundwater at SWMU 17 is to address approximately 87,800 ft^2 (2,300,000 gallons) of iron and manganese contaminated groundwater and approximately 17,400 ft^2 (500,000 gallons) of ammonia contaminated groundwater. Three alternatives were developed to address the groundwater contamination at SWMU 17. The alternatives are as follows:

Groundwater Alternative 1:	No Action
Groundwater Alternative 2:	Monitored Natural Attenuation (MNA), LUCs, and Site Monitoring
Groundwater Alternative 3:	Groundwater Extraction, Ex Situ Treatment, Surface Discharge, LUCs, and Site Monitoring

**Figure 3-6 Soil Corrective Measure Implementation Schedule
SWMU No. 17, NAVSTA Mayport
Mayport, Florida**

ID	Task Name	Duration
1	Implement Landuse Controls	20 Days
2	Place Asphalt Cover	45 Days
3	Long-term Monitoring	30 Years



Project: SWMU 17 Soil
Date: Thu 3/29/01

Task

Page 1

3.12.1 Groundwater Alternative 1: No Action

The No Action alternative serves as a baseline consideration or addresses sites that do not require active remediation. This alternative assumes that no corrective action would occur. No remedy would remain or be implemented. There would be no monitoring of conditions. Natural processes might eventually reduce low concentrations of contaminants in groundwater to acceptable levels, but the progress of attenuation would not be monitored.

3.12.2 Groundwater Alternative 2: MNA, LUCs, and Site Monitoring

Alternative 2 is of the limited action type. LUCs are rules, directives, policies, and other measures (e.g., preventing the usage of groundwater, preventing the installation of new wells, and requiring the posting of signs) adopted by the appropriate authorities in a manner consistent with applicable Federal, State, and local laws. Land use at SWMU 17 is to remain industrial. LUCs would be implemented in the form of a groundwater use prohibition. Once implemented, site monitoring will take place to assess MNA and contaminate migration and to ensure that the implemented LUC is being maintained. Imposition of the groundwater LUC will serve to both protect human health by precluding exposure to contamination and also serve to prevent contaminant migration to an underlying aquifer. LUC implementation will occur via preparation of a site-specific LUCIP which will describe the site location, the prohibition itself, its objectives, and other pertinent information. Once implemented, LUC oversight will be covered under the LUC MOA executed between FDEP, USEPA, and NAVSTA Mayport which provides for certain periodic site inspection and reporting requirements.

Monitoring consists of ensuring that LUCs remain in place and that periodic sampling and analysis of downgradient wells to assess groundwater and surface water quality occur. To fully delineate the extent of contamination, three additional monitoring wells (see Figure 3-7) will be installed. Monitoring of seven wells (three existing monitoring wells, one existing peizometer well, and three new monitoring wells) would occur for 30 years (on a quarterly basis for years 1-5 and semiannual basis for years 6-30), analyzing for organics, metals, and miscellaneous parameters.

Five-year site reviews would consist of evaluating the monitoring data for effectiveness of the corrective measure and LUCs.

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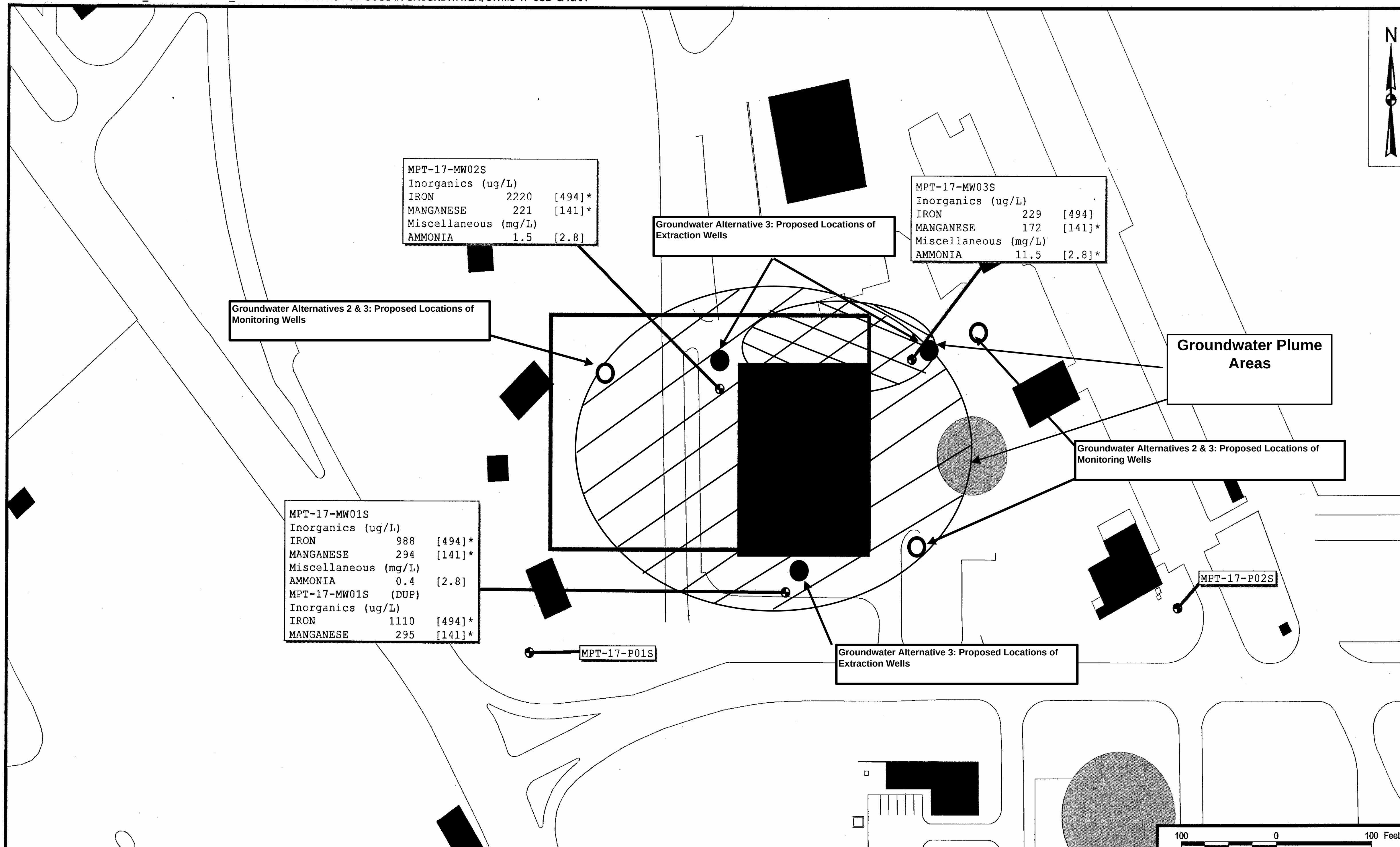

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COST/SCHED-AREA				APPROVED BY — DATE —
SCALE AS NOTED				DRAWING NO. Figure 3-7 REV. 0

3.12.3 Groundwater Alternative 3: Groundwater Extraction, Ex Situ Treatment, Surface Discharge, LUCs, and Site Monitoring

Alternative 3 would eliminate long-term management by addressing contaminated water through extraction and treatment. This alternative would offer aggressive remediation through removal and treatment of contaminants from the groundwater. The impacted area to be addressed corresponds to the areal extent shown in Appendix C. The extraction of groundwater would be performed using three extraction wells located within 20 feet of the downgradient side of the contaminated monitoring wells MPT-17-MW01S, MPT-17-MW02S, and MPT-17-MW03S (see Figure 3-5). These wells would be screened in the upper 20 feet of the shallow zone of the Surficial Aquifer. A pumping rate of 5 gpm at each well was modeled and was shown to provide a steady-state capture zone sufficient to control the contaminant plumes at SWMU 17. The model output and other design calculations are provided in Appendix E. A pumping test would be performed at SWMU 17 to determine the site-specific hydraulic conductivity, well yield, and capture zone to support the final design of an extraction well system. The pumped groundwater would be transported to a centralized location wherein the water would be treated. The modeling indicates it would be necessary to extract an estimated 59.1 million gallons of groundwater from the Surficial Aquifer to capture three pore-volumes of the groundwater plume area. The extracted groundwater would be passed through a greensand filtration system, and discharged to a local Publicly Owned Treatment Works (POTW) under a National Pollutant Discharge Elmination System (NPDES) discharge permit.

Greensand filtration is an oxidation filtration process used for the treatment of iron and manganese. The greensand filtration medium is produced by treating glauconite sand with potassium permanganate until the granular material (sand) is coated with a layer of manganese oxides, particularly manganese dioxide. Iron and manganese are reduced through a combination of oxidation, ion exchange, and particle entrapment. Backwash from the greensand filter would be discharged to the Station's treatment plant.

Extracted groundwater would be pumped to a 1,500-gallon equalization tank and then pumped through a greensand filtration system described above for the removal of iron and manganese (the primary COCs). Using the hydraulic data collected during the RFI, the total extraction rate from the groundwater extraction wells is estimated as 15 gpm. Considering approximately 25 percent capacity factor, the treatment system capacity would be designed for 20 gpm. The greensand filtration system would consist of three 24-inch diameter and 48-inch height carbon steel vertical filters. The greensand filters would be operated in parallel during normal operations. The backwash would be done using one filter at a time while the other two filters would still be in operation. The backwash would be done with the flow rate of 37 gpm at 12 gpm/ft^2. The duration of the backwash would be for approximately 2-3 minutes with a total volume of approximately 100 gallons. The filters would be skid mounted with automatic valves and controls. The minimum and maximum design pressure of the filters would be 30 and 75 psig, respectively. The filter medium would consist of a 32-inch layer of manganese greensand with a support layer of ¾-inch crushed gravel. The system would consist of an automatic injection system for the continuous injection of potassium permanganate. The details of the design calculations are presented in Appendix E. A block flow diagram of the treatment process is presented in Figure 3-8. Treated water would be discharged to a local POTW under an NPDES discharge permit. Contaminants such as ammonia would be addressed in the POTW. The period of treatment would be for approximately 8 years and would be monitored using seven monitoring wells (three existing monitoring wells, three existing peizometer well, and three new monitoring wells). Monitoring would involve periodic inspection of collection and treatment systems, monitoring the progress of remediation by sampling and analysis of groundwater for 30 years (or quarterly basis for years 1-8 and semiannual basis for years 9-30), and monitoring the efficiency of treatment.

Five-year site reviews would consist of evaluating the monitoring data for effectiveness of the corrective measure and LUCs.

3.13 EVALUATION OF CORRECTIVE MEASURES ALTERNATIVES FOR GROUNDWATER

The identified Corrective Measure Alternatives for groundwater were evaluated using the criteria described in Section 2.7.

3.13.1 Groundwater Alternative 1: No Action

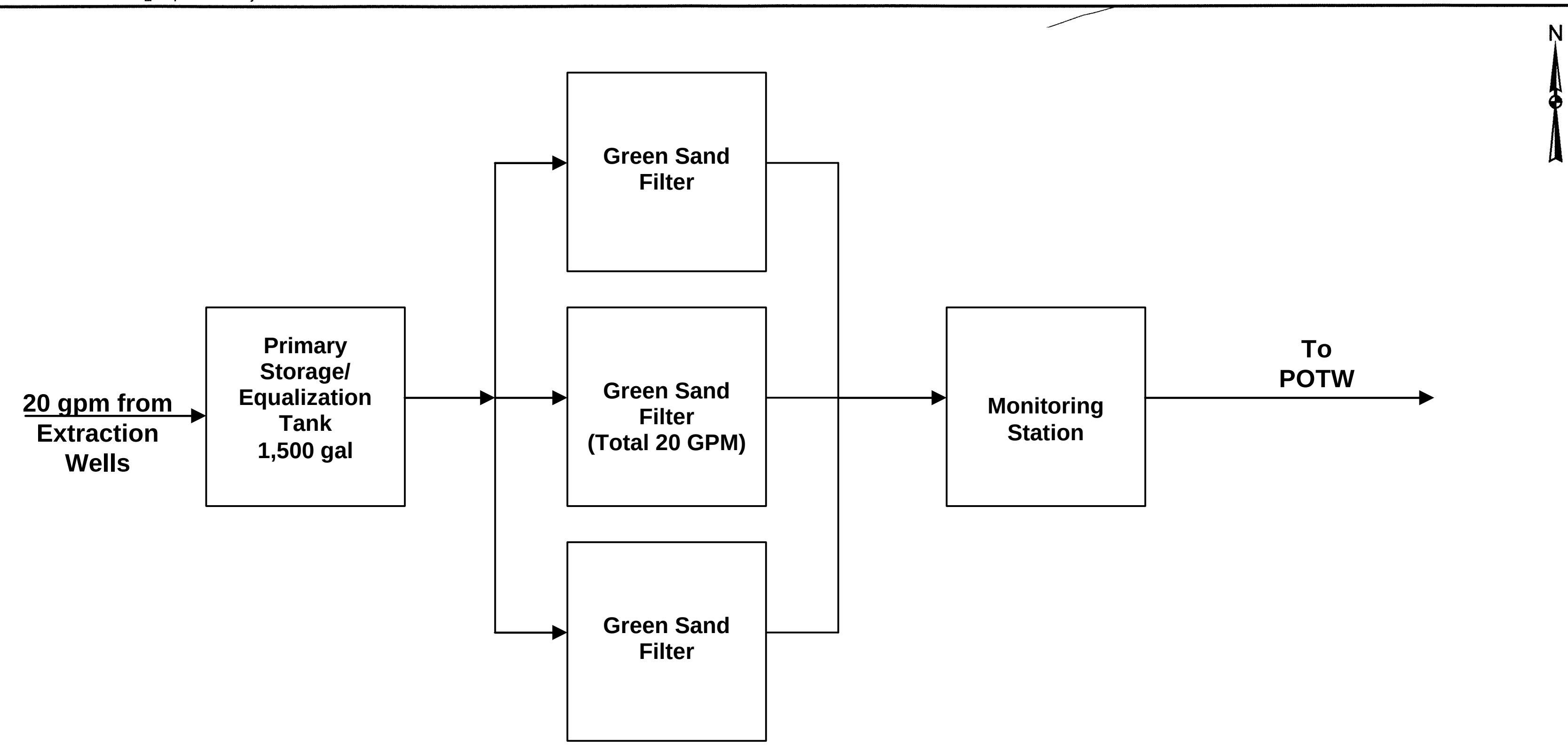
Protect Human Health and the Environment

No Action would allow unacceptable risks to human health and the environment. The No Action alternative would do nothing to effectively address contaminated groundwater or control its migration to offsite areas.

Attain Media Cleanup Standards

No Action would not attain the MCSs in a reasonable period of time. Natural processes might eventually reduce low concentrations of contaminants to acceptable levels, but the progress of attenuation would not be monitored.

P:\GIS\MAYPORT\SWMU14.APR 09Dec00 MJJ 04_Sample Location Layout



Legend
- Monitoring Well
- Piezometer
- Sediment
- Surface Soil
- SWMU Boundary

150 0 150 Feet

DRAWN BY MJJ	DATE 21July00		GROUNDWATER ALTERNATIVE 4: BLOCK FLOW DIAGRAM SWMU 17 CORRECTIVE MEASURES STUDY NAVSTA MAYPORT MAYPORT, FLORIDA	CONTRACT NO. N62467-94-D-0888
CHECKED BY ATJ	DATE 12/5/00			APPROVED BY MFA — DATE 12/13/00
COST/SCHED-AREA				APPROVED BY — DATE
SCALE AS NOTED				DRAWING NO. FIGURE 3-8 — REV. 0

Control the Source of Releases

No Action would not control or eliminate the source of contamination. Natural processes might eventually eliminate the source; however, the progress of attenuation would not be monitored.

Comply with any Applicable Standards for Management of Wastes

No Action would not involve any waste management activities and, therefore, no standards for management of wastes would apply.

Other Factors

a. Long-Term Reliability and Effectiveness

The No Action alternative would not provide long-term effectiveness or permanence at SWMU 17. Contaminants could continue to migrate and might pose a long-term risk to human health and the environment. Aside from natural processes, this alternative would offer no reduction in risk over long periods of time.

b. Reduction in the Toxicity, Mobility, or Volume of Wastes

Groundwater with contaminant concentrations above MCSs would remain in the subsurface. No Action would allow unacceptable risks to human health and the environment. Reduction of toxicity, mobility, or volume might occur but only through natural processes. Natural attenuation would not be documented in the absence of monitoring, and contaminated groundwater would migrate offsite.

c. Short-Term Effectiveness

The No Action alternative would not include any construction or remedial implementation, so there would be no short-term risks to workers, the community, or the environment. Neither the public nor the workers would be exposed to potential threats associated with construction or transportation.

d. Implementability

No technical implementability issues would exist because no corrective action would occur. Once the alternative was approved, there would be no administrative issues and no need to coordinate with other agencies or acquire permits. Future remedial actions, if needed, would not be hindered by the No Action alternative.

e. Cost

No corrective action would occur; therefore, there would be no capital costs. The only cost associated with the No Action alternative is the cost for 5-year reviews for a period of 30 years since no remedial action would occur. The estimated present worth total project cost is $18,000 including $7,375 for 5-year reviews.

3.13.2 Groundwater Alternative 2: MNA, LUCs, and Site Monitoring

Protect Human Health and the Environment

LUCs would effectively prevent direct human contact with contaminated groundwater by controlling the access and preventing the withdrawal of contaminated groundwater. If soil with contaminant concentrations above MCSs were addressed, further contamination to groundwater would be controlled. Monitoring would assess the groundwater quality, ensure that no new groundwater wells are installed and that restrictions on land use are in place, and assess the progress of natural processes. Over a period of time the contaminant concentrations in groundwater would reach levels that are protective to human health and the environment.

Attain Media Cleanup Standards

Provided that the source areas in soil are remediated, this alternative would attain the MCSs over an assumed period of 20-25 years. Natural attenuation may reduce low concentrations of contaminants to acceptable levels, which would be indicated by the monitoring.

Control the Source of Releases

This alternative would not control the source of releases as they are associated with the soil. LUCs and Site Monitoring would not control or eliminate the source of contamination. Natural processes would be monitored and recent data indicates that MNA would eventually reduce the groundwater COC concentrations.

Comply with any Applicable Standards for Management of Wastes

LUCs and Site Monitoring would not be involved in any waste management activities other than disposal of sample water which would be disposed of in accordance with applicable Federal, State, and local regulations. No other standards for management of wastes would apply.

Other Factors

a. Long-Term Reliability and Effectiveness

If the soil sources were removed, monitoring would provide long-term effectiveness or permanence due to natural processes. LUCs would prevent exposure to groundwater. Natural processes would offer reduction in risk over a period of time, the progress of which would be monitored. Monitoring would be effective in tracking the reduction in contaminant concentrations.

b. Reduction in the Toxicity, Mobility, or Volume of Wastes

There would be reduction in toxicity and volume due to natural processes. LUCs would minimize unacceptable risks to human health by controlling the access to groundwater; however, elevated COC concentrations might exist in the environment. Natural attenuation would be documented through monitoring.

c. Short-Term Effectiveness

Alternative 2 would involve the installation of three additional monitoring wells. The construction activity would be minimal and there would be low short-term risks to workers, the community, or the environment. The short-term risks would be manageable using the appropriate engineering and construction controls. Implementation of this alternative would not pose any safety concerns to nearby communities, the environment, or onsite workers with the use of appropriate engineering and construction management controls. Exposure to workers during sampling would be minimal and could be controlled by the use of appropriate PPE.

d. Implementability

Alternative 2 would be readily implementable. Monitoring wells could be readily installed. Limited manpower and materials are necessary to install and sample monitoring wells. Monitoring requires periodic sampling. Materials and labor are readily available for installing monitoring wells as well as for conducting the periodic sampling. The alternative is fairly reliable because monitoring would indicate the potential risks. This alternative should take less than one year to implement. Permits for installing monitoring wells might be required. Administrative issues and coordination with other agencies or acquiring permits are easily achievable. Future remedial actions, if needed, would not be hindered by this alternative.

e. Cost

Cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of the estimates. The estimated capital cost for Groundwater Alternative 2 would be $38,000. The annual O&M costs would be $31,000. Present worth cost over a period of 30 years would be $325,000. Detailed cost estimates are provided in Appendix D.

3.13.3 Groundwater Alternative 3: Groundwater Extraction, Ex Situ Treatment, Surface Discharge, LUCs, and Site Monitoring

Protect Human Health and the Environment

Alternative 3 would address the contamination by collecting and pumping the contaminated groundwater from the extraction wells and passing it through the greensand filtration unit. Aspects of LUCs and Site Monitoring are presented in Section 3.12.3. This alternative would provide a high degree of protection to human health and the environment. This alternative offers an aggressive approach for collecting and treating groundwater contaminants. As the contaminants would be withdrawn and treated, this alternative would provide a high level of protection of human health and the environment.

Attain Media Cleanup Standards

Alternative 3 would attain the MCS within an estimated period of 8 years (see Appendix E for details). As long as the sources in soil are addressed, further leaching of contaminants into groundwater would be prevented and MCSs would be attained in a relatively short period of time. Natural processes would eventually reduce low residual concentrations of contaminants to acceptable levels. The effectiveness of extraction wells would be indicated by the monitoring wells, and the performance of the metals treatment system (greensand filtration) would be indicated by the performance sampling.

Control the Source of Releases

Alternative 3 would control the source areas of the groundwater contamination by the use of groundwater collection system. This alternative addresses the leached components of the contaminants that may pose a threat to human health and the environment and would treat them. Soil alternatives need to address the source of contamination in soil from further leaching. If no such measures were to be put in place, the contaminants would eventually leach into the groundwater and be collected and treated by the metals treatment unit. Further, natural attenuation might eventually eliminate the source.

Comply with any Applicable Standards for Management of Wastes

Any waste generated during the construction and operation of the treatment system, and the installation and sampling of monitoring wells would be properly disposed of in accordance with applicable Federal, State, and local regulations. Generation of wastes subject to LDRs is not anticipated.

Other Factors

a. Long-Term Reliability and Effectiveness

Groundwater collection and treatment using greensand filtration is a proven and established technology. The long-term reliability and effectiveness of the system are proven. Once the system is properly designed and installed, Alternative 3 would be reliable and effective. The collection system would involve pumps that are reliable. This alternative would offer high long-term reliability and effectiveness. Being an ex situ treatment, failure of the system would be easily identifiable. The effectiveness of the system would be verified by sampling the monitoring wells.

b. Reduction in the Toxicity, Mobility, or Volume of Wastes

Treatment using greensand filtration would offer a reduction in toxicity, mobility, and volume. The modeling indicates it would be necessary to extract an estimated 59.1 million gallons of groundwater from the Surficial Aquifer to capture three pore-volumes of the groundwater plume area.

c. Short-Term Effectiveness

Alternative 3 would involve installation of extraction wells, designing and building a metals treatment facility (greensand filtration system), and installing monitoring wells. The construction of the collection system would involve excavation and might disturb a small portion of the contaminated areas. The short-term risks to workers and the environment would be manageable using the appropriate engineering and construction controls. As there are no nearby communities, exposures to the community from the contaminants are unlikely to occur. Implementation of this alternative would not pose any safety concerns to nearby communities, the environment, or onsite workers with the use of appropriate engineering and construction management controls. Dust suppression to control potential fugitive dust emissions and air monitoring would be used as necessary to ensure worker safety during remedial activities at the site. Limited O&M would be required for the greensand filtration and carbon units and no unacceptable exposure to workers is anticipated. Exposure to workers during sampling would be minimal and could be controlled by the use of appropriate PPE.

d. Implementability

Alternative 3 would be implementable. Extraction wells, greensand filtration units, and monitoring wells could be readily installed. Limited manpower and materials are necessary to install the collection and treatment systems. Greensand filtration unit is an established technology and has been used extensively. Materials and labor are readily available for installing the greensand filtration systems, extraction wells, and monitoring wells as well as for conducting periodic sampling. This alternative should take about one year to implement. Permits for installing the extraction wells, disposing sludge containing metals, and installing monitoring wells might be required. Administrative issues and coordination with other agencies or acquiring permits are easily achievable. Future remedial actions would not be hindered by this alternative.

e. Cost

Cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of the estimates. The estimated capital cost for Groundwater Alternative 3 would be $324,000. The annual O&M costs would be $88,000. Present worth cost over a period of 30 years would be $1,111,000. Detailed cost estimates are provided in Appendix D.

3.14 RECOMMENDATION FOR A FINAL GROUNDWATER CORRECTIVE MEASURES ALTERNATIVE

The recommendation for a final groundwater corrective measure alternative will be based on a comparative analysis of groundwater alternatives.

3.14.1 Comparative Analysis of Groundwater Alternatives

A comparative analysis of groundwater alternatives is presented to address how effectively each alternative will comply with the standards listed in the guidance (USEPA, 1994). Groundwater Alternative 1 (No Action) is considered for baseline purposes and is not expected to satisfy any of the requirements.

Protect Human Health and Environment

Groundwater Alternatives 2 and 3 are effective in protecting human health and the environment to some extent. Alternative 1 would allow for unacceptable risks to human health and the environment. Once the contaminant sources in the soil are controlled, Alternative 2 would provide protection to human health and the environment. Alternative 3 would be relatively more effective compared to Alternative 2. However, the Surficial Aquifer is not currently used as a potable water source and site-specific ecological assessment in the RFI indicated no potential effects to the ecological receptors at SWMU 17. Under these conditions, Alternative 2 would protect human health and the environment in a cost-effective manner. Both alternatives would require long-term monitoring and LUCs to ensure their effectiveness; however, Alternative 3 would require monitoring for a relatively shorter time frame. Alternative 3 would provide treatment to address the contaminants and, therefore, would provide a higher degree of protection while Alternative 2 would depend on natural processes. Because of the limited contamination, Alternative 2 would be able to provide an adequate degree of protection.

Attain Media Cleanup Standards

Groundwater Alternatives 1 and 2 would attain MCSs in about 20-25 years but the SWMU would not be monitored for Alternative 1. Alternative 3 would attain the MCS in about 8 years because of the treatment steps involved in the alternatives. Alternative 3 is more aggressive compared to Alternative 2 and would attain MCSs in less time. Addressing the source areas in the soil zone is important in achieving the standards in a short period of time. Groundwater Alternative 2 would attain the MCSs at a relatively longer period of time as it relies on natural attenuation processes.

Control the Source of Releases

The major source of contamination is the soil above and within the aquifer matrix. None of the alternatives would directly control the source; however, Alternative 3 would provide the most effective way of capturing and treating the released contaminants.

Comply with any Applicable Standards for Management of Wastes

Alternative 1 would not generate any waste. Groundwater Alternative 2 would generate the least amount of waste and therefore complies with all applicable standards more effectively than the other alternatives. Alternative 3 would generate wastes during construction and would produce sludge containing metals during operation. Alternative 2 would not involve the generation/management of waste when implemented except for a small quantity during the development of monitoring wells. The waste generated in all alternatives would be disposed of offsite following all applicable Federal, State, and local requirements. Some of the waste streams in Alternative 3 are expected to have LDRs.

Other Factors

a. Long-Term Reliability and Effectiveness

Groundwater Alternative 3 would have the highest long-term reliability and effectiveness because of aggressive treatment. The treatment technology involved in Alternative 3 is proven reliable. Alternative 2 would rely on natural processes in addressing the contaminated water and the reliability would be low; however, natural processes has been successfully implemented at many sites to address the limited extent of contamination. The Surficial Aquifer is not currently used as a potable water source. Under these conditions, Alternative 2 would be able to provide adequate long-term reliability and effectiveness in a cost-effective manner. Alternative 1 would not provide for long-term reliability and effectiveness at SWMU 17.

b. Reduction in the Toxicity, Mobility, or Volume of Wastes

Groundwater Alternative 3 would have the highest reduction in toxicity, mobility, and volume. Pumping water from extraction wells would reduce mobility of contaminants and greensand filtration would reduce toxicity. Alternative 2 would rely on natural processes for the reduction of toxicity and, once the soil source areas are controlled, the COC concentrations should decrease. Under these conditions, Alternative 2 would be able to provide adequate reduction in the toxicity, mobility, or volume of contaminated groundwater in a cost-effective manner. Alternative 1 also relies on natural processes for the reduction of toxicity but would not be monitored.

c. Short-Term Effectiveness

Groundwater Alternative 1 does not involve any remedial activities. Groundwater Alternative 2 would offer the highest short-term effectiveness because the alternative does not involve any major construction activity and does not pose any threat to local communities. Alternative 3 would require relatively extensive construction activities compared to Alternative 2. However, none of these alternatives would pose any threat to local communities or onsite personnel during the implementation of the corrective measures. Onsite workers would be protected from exposure to hazardous substances through the appropriate use of PPE.

d. Implementability

All alternatives are implementable; however, Alternatives 1 and 2 would offer the highest implementability. Monitored natural attenuation has been implemented at several sites with limited contamination. The technologies involved in Alternative 3 are proven and several similar systems were installed at various locations. Construction and operational services for all alternatives are easily available. Administrative issues and coordination with other agencies or acquiring permits are easily achievable. Future remedial actions would not be hindered by the alternatives. Alternative 3 would take longer time compared to Alternative 2 in implementing the corrective measure. For Alternative 3 offsite TSDFs are available for the disposal of metal sludges and excavated soil.

e. Cost

Costs for Alternative 1 would only be for the 5 year reviews. Costs associated with Alternative 2 would be the next lowest and those of Alternative 3 would be the highest. The estimated capital, O&M, and net present worth costs are presented in Table 3-25. Detailed cost estimates are provided in Appendix D.

TABLE 3-25

**SWMU 17, COSTS FOR GROUNDWATER ALTERNATIVES
NAVSTA MAYPORT, FLORIDA**

ALTERNATIVE	CAPITAL COSTS	ANNUAL O&M COSTS	TOTAL PRESENT WORTH COSTS*
1	$0	• $7,375 every 5th year	$18,000
2	$38,000	• $31,000 for 1-6 years • $18,000 for 6-30 years • with an additional $6,704 every 5 years	$325,000
3	$324,000	• $88,000 for 1-6 years • $39,000 for 6-30 years • with an additional $6,704 every 5 years	$1,111,000

3.14.2 Recommendation

Based on the screening of technologies and assessment of various alternatives performed, Alternative 2 is recommended for addressing the groundwater contamination at SWMU 17.

3.15 DESCRIPTION OF THE RECOMMENDED GROUNDWATER CORRECTIVE MEASURES ALTERNATIVE

3.15.1 Summary of the Groundwater Corrective Measure and Rationale

a. Description of the Corrective Measure and Rationale for Selection

The recommended corrective measure alternative involves LUCs and Site Monitoring to address limited groundwater contamination at the site. Any elaborate treatment system would not be justified because the Surficial Aquifer is not currently used as a potable water source and there is no risk to the ecological receptors. Furthermore, the contaminants in the groundwater at SWMU 17 are not expected to affect the surface water at the Mayport Turning Basin because the Mayport Turning Basin is approximately 300 feet downgradient of SWMU 17. In addition, according to the RFI, two layers of retaining walls constructed along the perimeter of the Mayport Turning Basin prevent or limit the direct interaction between groundwater and surface water. Once the source of contamination is addressed, the volume and extent of contamination to be addressed would be limited. Alternative 2 relies on natural processes whose progress would be monitored by the periodic sampling. Monitored natural attenuation has been successfully implemented at many sites with limited contamination. Once the source of contamination is addressed, Alternative 2 would offer a cost-effective corrective action in a reasonable amount of time.

b. Performance Expectations

The recommended corrective measure alternative would prevent potential human exposure pathways and achieve groundwater MCSs through natural processes over a period of time.

c. Preliminary Design Criteria and Rationale

The extent of groundwater contamination has been identified. Recent sampling activity has shown a gradual decrease in the contaminant concentrations and the contamination has not migrated beyond the site boundary. It is estimated that a total of three additional monitoring wells would be installed and a total of seven wells would be sampled along with surface water sampling on a periodic basis. As the contaminant concentrations show a gradual decrease, the number of wells to be monitored would go down. By addressing the contaminated soil as part of the soil corrective measures, the potential for leaching to groundwater would be minimized. Natural processes would eventually decrease the residual contamination to meet the standards.

d. General O&M Requirements

No major construction would be required other than installing new monitoring wells. Periodic sampling would be needed once the implementation is completed. O&M requirements would be minimal.

e. Long-Term Monitoring Requirements

Groundwater and surface water monitoring would be conducted on a periodic basis until the COC concentrations are below MCSs to verify successful implementation of the corrective measures.

3.15.2 Design and Implementation Precautions

a. Special Technical Problems

Monitoring well installation is a common and well-established method to perform monitoring. No technical problems are anticipated in implementing the corrective measures.

b. Additional Engineering Data Required

No additional engineering data are required; however, additional downgradient wells would be needed for periodic sampling.

c. Permits and Regulatory Requirements

Permits for installing monitoring wells may be required from the base. Requirements under RCRA have to be satisfied for the generation and storage of contaminated soil and water. RCRA permits are required for the base as well as for the disposal facility.

d. Health and Safety Requirements

OSHA requirements have to be satisfied during construction activities. Ambient air monitoring would be conducted near the site and the surrounding community would be notified in any case of emergency.

e. Community Relations Activities

The selection of preferred corrective measures and details on how they would be implemented would be presented to the local community.

3.15.3 Cost Estimate and Schedule

a. Capital Cost Estimate

The capital costs involved in the implementation of the recommended corrective measures are presented in Table 3-25. Detailed cost estimates are provided in Appendix D.

b. O&M Cost Estimate

O&M costs for the recommended corrective measures are presented in Table 3-25.

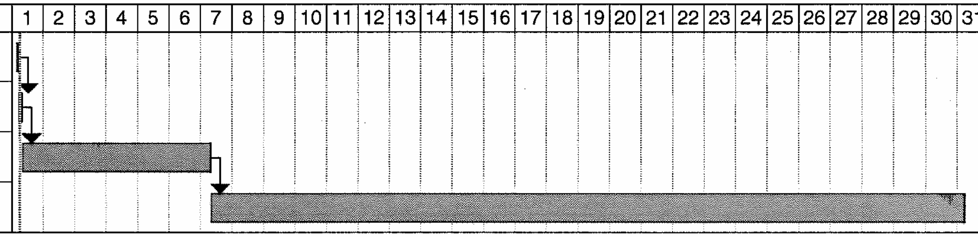
c. Project Schedule

Figure 3-9 presents the project schedule for the implementation of the recommended corrective measure.

Figure 3-7 Groundwater Corrective Measure Implementation Schedule
SWMU No. 17, NAVSTA Mayport
Mayport, Florida

Figure 3-9 Groundwater Corrective Measure Implementation Schedule
SWMU 17, NAVSTA Mayport
Mayport, Florida

ID	Task Name	Duration
1	Implement Landuse Controls	20 Days
2	Installation of Additional Monitoring Wells	30 Days
3	Long-term Monitoring and Sampling (Quarterly)	6 Years
4	Long-term Monitoring and Sampling (Semi-annually)	24 Years



Project: SWMU 17-Groundwater
Date: Thu 3/29/01

Task

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APPENDIX A

CMS DATA SET

Appendix A1

- **A1-1 Explanation of Data Qualifiers**

TABLE A1-1
Explanation of Data Qualifiers
SWMU 12 and 17, NAVSTA Mayport
Mayport, Florida

Data Qualifier	Explanation of Qualifier
U	The material was analyzed for, but was not detected. The associated numerical value is the quantitation limit.
J	Estimated value, either because QC criteria were not met or because the amount detected is below the documented quantitation limit.
UJ	Undetected but the number reported as the quantitation limit is an estimated value
R	Rejected, so data are of "information only" quality and should be supplemented with additional data for decision making.

SWMU 12

NEUTRALIZATION BASIN

APPENDIX A2

- A2-1. Surface Soil
- A2-2. Groundwater

TABLE A2-1
SWMU No. 12, Surface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-11-SS01	MPT-11-SS02	MPT-11-SS02	MPT-11-SS03
Sample ID	11S00101	11S00201	11S00201D	11S00301
Sample Date	11/14/95	11/14/95	11/14/95	11/14/95
Inorganics (mg/kg)				
ANTIMONY	0.38 UJ	0.21 U	0.21 U	0.22 U
ARSENIC	0.96 J	1.1 J	1.3 J	1 J
BARIUM	8 J	5.3 J	5.3 J	5.9 J
BERYLLIUM	0.05 J	0.08 J	0.06 J	0.06 J
CADMIUM	1.2	0.25 J	0.19 U	0.19 U
CHROMIUM	1.7 J	3.3	3.1	3.4
COBALT	0.63 U	0.65 J	0.62 U	0.65 U
COPPER	3.8 J	1.9 J	2 J	2.6 J
CYANIDE	0.14 J	0.11 J	0.17 J	0.08 U
LEAD	13.7 J	9.7 J	14 J	8.1 J
MERCURY	0.03 U	0.03 U	0.03 U	0.05 J
NICKEL	2.6 J	1.8 U	1.8 U	1.9 U
SELENIUM	0.13 UJ	0.12 UJ	0.12 UJ	0.13 U
SILVER	0.46 U	0.45 U	0.45 U	0.47 U
THALLIUM	0.13 UJ	0.12 UJ	0.12 UJ	0.13 UJ
TIN	2.8 U	2.7 U	2.7 U	2.9 U
VANADIUM	10.3 J	5.8 J	6.2 J	5.4 J
ZINC	23.3 J	16.8 J	17.4 J	16.7 J

TABLE A2-2
SWMU No. 12, Groundater - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-11-MW01S	MPT-11-MW02S	MPT-11-MW03S
Sample ID	11MW001S	11MW002S	11MW003S
Sample Date	07/07/94	07/06/94	07/06/94
Volatile Organics (ug/L)			
1,1,1,2-TETRACHLOROETHANE	5 U	5 U	5 U
1,1,1-TRICHLOROETHANE	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5 U	5 U	5 U
1,1-DICHLOROETHANE	5 U	5 U	1 J
1,1-DICHLOROETHENE	5 U	5 U	5 U
1,2,3-TRICHLOROPROPANE	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	10 U	10 U	10 U
1,2-DICHLOROBENZENE	5 U	2 J	1 J
1,2-DICHLOROETHANE	5 U	5 U	5 U
1,2-DICHLOROETHENE (TOTAL)	5 U	5 U	2 J
1,2-DICHLOROPROPANE	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5 U	5 U	5 U
1,4-DIOXANE	200 R	200 R	200 R
2-BUTANONE	10 U	10 U	10 U
2-CHLOROETHYL VINYL ETHER	10 U	10 U	10 U
2-HEXANONE	10 U	10 U	10 U
3-CHLOROPROPENE	5 U	5 U	5 U
4-CHLORO-3-METHYLPHENOL	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10 U	10 U	10 U
ACETONE	10 U	10 U	10 U
ACETONITRILE	100 U	100 U	100 U
ACROLEIN	100 U	100 U	100 U
ACRYLONITRILE	100 U	100 U	100 U
BENZENE	5 U	5 U	5 U
BROMODICHLOROMETHANE	5 U	5 U	5 U
BROMOFORM	5 U	5 U	5 U
BROMOMETHANE	10 UJ	10 UJ	10 UJ
CARBON DISULFIDE	5 U	5 U	5 U
CARBON TETRACHLORIDE	5 U	5 U	5 U
CHLOROBENZENE	5 U	5 U	5 U
CHLOROETHANE	10 U	10 U	10 U
CHLOROFORM	5 U	5 U	5 U
CHLOROMETHANE	10 U	10 U	10 UJ
CHLOROPRENE	200 U	200 U	200 U
CIS-1,3-DICHLOROPROPENE	5 U	5 U	5 U
DIBROMOCHLOROMETHANE	5 U	5 U	5 U
DIBROMOMETHANE	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	10 UJ	10 UJ	10 UJ
ETHYL METHACRYLATE	5 U	5 U	5 U
ETHYLBENZENE	5 U	5 U	5 U
ETHYLENE DIBROMIDE	5 U	5 U	5 U
IODOMETHANE	10 UJ	10 UJ	10 UJ
ISOBUTYL ALCOHOL	200 U	200 U	200 U
METHACRYLONITRILE	5 U	5 U	5 U
METHYL METHACRYLATE	10 UJ	10 U	10 U
METHYLENE CHLORIDE	5 U	5 U	1 J
PENTACHLOROETHANE	10 U	10 U	10 U
PROPIONITRILE	100 U	100 U	100 U
STYRENE	5 U	5 U	5 U
TETRACHLOROETHENE	5 U	5 U	5 U
TOLUENE	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5 U	5 U	5 U
TRANS-1,4-DICHLORO-2-BUTENE	5 U	5 U	5 U
TRICHLOROETHENE	5 U	5 U	5 U
TRICHLOROFLUOROMETHANE	5 U	5 U	5 U
VINYL ACETATE	10 U	10 U	10 U
VINYL CHLORIDE	10 U	10 U	10 U
XYLENES, TOTAL	5 U	5 U	5 U
Semivolatile Organics (ug/L)			
1,2,4,5-TETRACHLOROBENZENE	50 U	50 U	50 U
1,2,4-TRICHLOROBENZENE	10 U	10 U	10 U
1,2-DIPHENYLHYDRAZINE	10 U	10 U	10 U
1,3,5-TRINITROBENZENE	10 UJ	10 UJ	10 UJ
1,3-DINITROBENZENE	10 U	10 U	10 U
1,4-NAPHTHOQUINONE	1000 UJ	1000 UJ	1000 UJ
1-NAPHTHYLAMINE	50 U	50 U	50 U
2,3,4,6-TETRACHLOROPHENOL	10 U	10 U	10 U
2,4,5-TRICHLOROPHENOL	50 U	50 U	50 U
2,4,6-TRICHLOROPHENOL	10 U	10 U	10 U

TABLE A2-2
SWMU No. 12, Groundater - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-11-MW01S	MPT-11-MW02S	MPT-11-MW03S
Sample ID	11MW001S	11MW002S	11MW003S
Sample Date	07/07/94	07/06/94	07/06/94
2,4-DICHLOROPHENOL	10 U	10 U	10 U
2,4-DIMETHYLPHENOL	10 U	10 U	10 U
2,4-DINITROPHENOL	50 UJ	50 UJ	50 UJ
2,4-DINITROTOLUENE	10 U	10 U	10 U
2,6-DICHLOROPHENOL	10 U	10 U	10 U
2,6-DINITROTOLUENE	10 U	10 U	10 U
2-ACETYLAMINOFLUORENE	10 U	10 U	10 U
2-CHLORONAPHTHALENE	10 U	10 U	10 U
2-CHLOROPHENOL	10 U	10 U	10 U
2-METHYLNAPHTHALENE	10 U	10 U	10 U
2-METHYLPHENOL	10 U	10 U	10 U
2-NAPHTHYLAMINE	50 U	50 U	50 U
2-NITROANILINE	50 U	50 U	50 U
2-NITROPHENOL	10 U	10 U	10 U
2-PICOLINE	50 U	50 U	50 U
3&4-METHYLPHENOL	10 U	10 U	10 U
3,3'-DICHLOROBENZIDINE	20 U	20 U	20 U
3,3'-DIMETHYLBENZIDINE	10 U	10 U	10 U
3-METHYLCHOLANTHRENE	10 U	10 U	10 U
3-NITROANILINE	50 UJ	50 UJ	50 UJ
4,6-DINITRO-2-METHYLPHENOL	50 UJ	50 UJ	50 UJ
4-AMINOBIPHENYL	50 U	50 U	50 U
4-BROMOPHENYL PHENYL ETHER	10 U	10 U	10 U
4-CHLOROANILINE	10 UJ	10 UJ	10 UJ
4-CHLOROPHENYL PHENYL ETHER	10 U	10 U	10 U
4-NITROANILINE	50 U	50 U	50 U
4-NITROPHENOL	50 U	11 J	13 J
4-NITROQUINOLINE-1-OXIDE	500 UJ	500 UJ	500 UJ
5-NITRO-O-TOLUIDINE	10 U	10 U	10 U
7,12-DIMETHYLBENZ(A)ANTHRACENE	10 U	10 U	10 U
ACENAPHTHENE	10 U	10 U	10 U
ACENAPHTHYLENE	10 U	10 U	10 U
ACETOPHENONE	10 U	10 U	10 U
ANILINE	10 UJ	10 UJ	10 UJ
ANTHRACENE	10 U	10 U	10 U
ARAMITE	50 U	50 U	50 U
BENZIDINE	50 UJ	50 UJ	50 UJ
BENZO(A)ANTHRACENE	10 U	10 U	10 U
BENZO(A)PYRENE	10 U	10 U	10 U
BENZO(B)FLUORANTHENE	10 U	10 U	10 U
BENZO(G,H,I)PERYLENE	10 U	10 U	10 U
BENZO(K)FLUORANTHENE	10 U	10 U	10 U
BENZOIC ACID	50 U	50 U	50 U
BENZYL ALCOHOL	10 U	10 U	10 U
BIS(2-CHLOROETHOXY)METHANE	10 U	10 U	10 U
BIS(2-CHLOROETHYL)ETHER	10 U	10 U	10 U
BIS(2-CHLOROISOPROPYL) ETHER	10 U	10 U	10 U
BIS(2-ETHYLHEXYL)PHTHALATE	10 U	10 U	10 U
BUTYLBENZYL PHTHALATE	10 U	10 U	10 U
CHLOROBENZILATE	0.5 U	0.5 U	0.5 U
CHRYSENE	10 U	10 U	10 U
DI-N-BUTYL PHTHALATE	10 U	10 U	10 U
DI-N-OCTYL PHTHALATE	10 U	10 U	10 U
DIALLATE	1 U	1 U	1 U
DIBENZO(A,H)ANTHRACENE	10 U	10 U	10 U
DIBENZOFURAN	10 U	10 U	10 U
DIETHYL PHTHALATE	10 U	10 U	10 U
DIMETHYL PHTHALATE	10 U	10 U	10 U
ETHYL METHANESULFONATE	10 U	10 U	10 U
FLUORANTHENE	10 U	10 U	10 U
FLUORENE	10 U	10 U	10 U
HEXACHLOROBENZENE	10 U	10 U	10 U
HEXACHLOROBUTADIENE	10 U	10 U	10 U
HEXACHLOROCYCLOPENTADIENE	10 U	10 U	10 U
HEXACHLOROETHANE	10 U	10 U	10 U
HEXACHLOROPHENE	500 UJ	500 UJ	500 UJ
HEXACHLOROPROPENE	50 U	50 U	50 U
INDENO(1,2,3-CD)PYRENE	10 U	10 U	10 U
ISODRIN	0.02 U	0.02 U	0.02 U
ISOPHORONE	10 U	10 U	10 U
ISOSAFROLE	50 U	50 U	50 U
METHAPYRILENE	50 UJ	50 UJ	50 UJ

TABLE A2-2
SWMU No. 12, Groundater - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-11-MW01S	MPT-11-MW02S	MPT-11-MW03S
Sample ID	11MW001S	11MW002S	11MW003S
Sample Date	07/07/94	07/06/94	07/06/94
METHYL METHANESULFONATE	10 U	10 U	10 U
N-NITROSO-DI-N-PROPYLAMINE	10 U	10 U	10 U
N-NITROSODI-N-BUTYLAMINE	10 U	10 U	10 U
N-NITROSODIETHYLAMINE	10 U	10 U	10 U
N-NITROSODIMETHYLAMINE	10 U	10 U	10 U
N-NITROSODIPHENYLAMINE	10 U	10 U	10 U
N-NITROSOMETHYLETHYLAMINE	10 U	10 U	10 U
N-NITROSOMORPHOLINE	10 U	10 U	10 U
N-NITROSOPIPERIDINE	10 UJ	10 UJ	10 UJ
N-NITROSOPYRROLIDINE	10 U	10 U	10 U
NAPHTHALENE	10 U	10 U	10 U
NITROBENZENE	10 U	10 U	10 U
O-TOLUIDINE	10 U	10 U	10 U
P-DIMETHYLAMINOAZOBENZENE	10 U	10 U	10 U
P-PHENYLENEDIAMINE	500 U	500 U	500 U
PENTACHLOROBENZENE	50 U	50 U	50 U
PENTACHLORONITROBENZENE	50 U	50 U	50 U
PENTACHLOROPHENOL	50 U	50 U	50 U
PHENACETIN	10 UJ	10 UJ	10 UJ
PHENANTHRENE	10 U	10 U	10 U
PHENOL	10 U	43	10 U
PHENYL-TERT-BUTYLAMINE	50 U	50 U	50 U
PRONAMIDE	10 U	10 U	10 U
PYRENE	10 U	10 U	10 U
PYRIDINE	50 U	50 U	50 U
SAFROLE	50 U	50 U	50 U
Pesticides/PCBs (ug/L)			
4,4'-DDD	0.04 U	0.04 U	0.04 U
4,4'-DDE	0.02 U	0.02 U	0.04 U
4,4'-DDT	0.04 U	0.04 U	0.04 U
ALDRIN	0.02 U	0.02 U	0.04 U
ALPHA-BHC	0.02 U	0.02 U	0.04 U
AROCLOR-1016	1 U	1 U	2 U
AROCLOR-1221	2 U	2 U	4 U
AROCLOR-1232	2 U	2 U	4 U
AROCLOR-1242	1 U	1 U	2 U
AROCLOR-1248	1 U	1 U	2 U
AROCLOR-1254	0.5 U	0.5 U	0.5 U
AROCLOR-1260	0.5 U	0.5 U	0.5 U
BETA-BHC	0.04 U	0.04 U	0.08 U
CHLORDANE	0.2 U	0.2 U	0.2 U
DELTA-BHC	0.02 U	0.02 U	0.04 U
DIELDRIN	0.02 U	0.02 U	0.04 U
ENDOSULFAN I	0.02 U	0.02 U	0.04 U
ENDOSULFAN II	0.04 U	0.04 U	0.04 U
ENDOSULFAN SULFATE	0.04 U	0.04 U	0.04 U
ENDRIN	0.04 U	0.04 U	0.04 U
ENDRIN ALDEHYDE	0.04 U	0.04 U	0.04 U
ENDRIN KETONE	0.04 U	0.04 U	0.04 U
GAMMA-BHC (LINDANE)	0.02 UJ	0.02 UJ	0.04 UJ
HEPTACHLOR	0.02 UJ	0.02 UJ	0.04 UJ
HEPTACHLOR EPOXIDE	0.02 U	0.02 U	0.04 U
KEPONE	1 U	1 U	1 U
METHOXYCHLOR	0.08 U	0.08 U	0.08 U
TOXAPHENE	1 U	1 U	1 U
Inorganics (ug/L)			
ANTIMONY	2.2 U	2.2 U	2.2 U
ARSENIC	3.2 J	42.5	1.7 J
BARIUM	3.9 J	1.5 U	5.6 J
BERYLLIUM	0.15 U	0.15 U	0.15 U
CADMIUM	2.7 U	2.7 U	2.7 U
CALCIUM	90300	1770 J	173000
CHROMIUM	2.8 U	5.1 J	2.8 U
COBALT	3.6 U	3.6 U	3.6 U
COPPER	7.4 J	19.7 J	3.2 U
CYANIDE	0.69 J	0.81 U	0.94 J
IRON	26.2 U	180	915
LEAD	0.97 U	5.7 J	1 J
MAGNESIUM	7300	98.3 J	30700
MANGANESE	7.5 J	2.6 U	87.2
MERCURY	0.08 U	0.12 J	0.08 U
NICKEL	9.7 U	20.4 J	9.7 U

TABLE A2-2
SWMU No. 12, Groundater - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-11-MW01S	MPT-11-MW02S	MPT-11-MW03S
Sample ID	11MW001S	11MW002S	11MW003S
Sample Date	07/07/94	07/06/94	07/06/94
SELENIUM	1.3 UJ	13.2 UJ	1.3 UJ
SILVER	2.7 U	2.7 U	2.7 U
SODIUM	15300 J	831000	223000
THALLIUM	1.3 UJ	1.3 UJ	1.3 UJ
TIN	9.5 U	9.5 U	9.5 U
VANADIUM	5 J	110	2.1 U
ZINC	3.7 U	14.1 J	2.4 U
Miscellaneous Parameters (mg/L)			
ALKALINITY AS CACO3	248	1440	347
AMMONIA, AS NITROGEN	0.7	2.2	0.7
CHLORIDE	34	1030	1190
HARDNESS AS CaCO3	353	27	281
SULFATE	29.3	105	95.9
SULFIDE	1 U	2	1 U
TOTAL DISSOLVED SOLIDS	374	2550	1370
TOTAL KJELDAHL NITROGEN	0.7	4.7	1.5
TOTAL ORGANIC CARBON	3.2	23.3	17.2
TOTAL PHOSPHORUS	0.32	1.16	0.19
Petroleum Hydrocarbons (mg/L)			
OIL & GREASE	5 U	10	5 U

SWMU 17

CARBONACEOUS FUEL BOILER AREA

APPENDIX A3

- A3-1. Surface Soil
- A3-2. Subsurface Soil
- A3-3. Groundwater

TABLE A3-1
SMWU No. 17, Surface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-SS01	MPT-17-SS01	MPT-17-SS02	MPT-17-SS03	MPT-17-SS04	MPT-17-SS05	MPT-17-SS06	MPT-17-SS07	MPT-17-SS08	MPT-17-SS09	MPT-17-SS09	MPT-17-SS10	MPT-17-SS11
Sample ID	17S00101	17S00101D	17S00201	17S00301	17S00401	17S00501	17S00601	17S00701	17S00801	17S00901	17S00901D	17S01001	17S01101
Sample Date	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95	05/24/95	05/24/95	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95
Volatile Organics (ug/kg)													
1,1,1,2-TETRACHLOROETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
1,1,1-TRICHLOROETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROPROPANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	10 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U
1,2-DICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHENE (TOTAL)	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
1,4-DIOXANE	210 R	210 R	220 R	220 R	220 R	220 R	220 R	220 R	220 R	220 R	220 R	220 R	210 R
2-BUTANONE	10 U	10 U	11 U	11 U	11 U	11	11 U	11 U	11 U	11 U	11 U	11 U	10 U
2-CHLOROETHYL VINYL ETHER	10 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U
2-HEXANONE	10 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U
3-CHLOROPROPENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
4-CHLORO-3-METHYLPHENOL	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
4-METHYL-2-PENTANONE	10 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U
ACETONE	10 U	10 U	11 U	17 U	11 U	49 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U
ACETONITRILE	100 U	100 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	100 U
ACROLEIN	100 UJ	100 UJ	110 UJ	110 UJ	110 UJ	110 U	110 U	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	100 UJ
ACRYLONITRILE	100 UJ	100 UJ	110 UJ	110 UJ	110 UJ	110 U	110 U	110 UJ	110 UJ	110 UJ	110 UJ	110 UJ	100 UJ
BENZENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
BROMOFORM	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
BROMOMETHANE	10 U	10 U	11 U	11 U	11 U	11 UJ	11 U	11 U	11 U	11 U	11 U	11 U	10 U
CARBON DISULFIDE	2 J	5 U	5 U	5 U	5 U	3 J	5 U	5 U	6 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
CHLOROETHANE	10 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U
CHLOROFORM	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	10 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U
CHLOROPRENE	210 U	210 U	220 U	220 U	220 U	220 U	220 U	220 U	220 U	220 U	220 U	220 U	210 U
CIS-1,3-DICHLOROPROPENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
DIBROMOCHLOROMETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
DIBROMOMETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	10 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U
ETHYL METHACRYLATE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
ETHYLBENZENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
ETHYLENE DIBROMIDE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
IODOMETHANE	10 U	10 U	11 U	11 U	11 U	11 UJ	11 UJ	11 U	11 U	11 U	11 U	11 U	10 U
ISOBUTYL ALCOHOL	210 U	210 U	220 U	220 U	220 U	220 U	220 U	220 U	220 U	220 U	220 U	220 U	210 U
METHACRYLONITRILE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
METHYL METHACRYLATE	10 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U
METHYLENE CHLORIDE	16 U	14 U	12 U	11 U	13 U	5 U	5 U	9 U	9 U	8 U	9 U	13 U	10 U
PENTACHLOROETHANE	10 U	10 U	11 U	11 U	11 U	11 U	11 UJ	11 U	11 U	11 U	11 U	11 U	10 U
PROPIONITRILE	100 U	100 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	100 U
STYRENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
TOLUENE	4 J	3 J	5 U	5 U	5 U	5 U	1 J	5 U	6 U	5 U	5 U	1 J	5 U
TRANS-1,3-DICHLOROPROPENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U

TABLE A3-1
SMWU No. 17, Surface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-SS01	MPT-17-SS01	MPT-17-SS02	MPT-17-SS03	MPT-17-SS04	MPT-17-SS05	MPT-17-SS06	MPT-17-SS07	MPT-17-SS08	MPT-17-SS09	MPT-17-SS09	MPT-17-SS10	MPT-17-SS11
Sample ID	17S00101	17S00101D	17S00201	17S00301	17S00401	17S00501	17S00601	17S00701	17S00801	17S00901	17S00901D	17S01001	17S01101
Sample Date	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95	05/24/95	05/24/95	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95
TRANS-1,4-DICHLORO-2-BUTENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
TRICHLOROFLUOROMETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	5 U	5 U	5 U	5 U
VINYL ACETATE	10 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U
VINYL CHLORIDE	10 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	10 U
XYLENES, TOTAL	10	8	5 U	5 U	5 J	2 J	3 J	2 J	6 U	5 U	2 J	6	1 J
Semivolatile Organics (ug/kg)													
1,2,4,5-TETRACHLOROBENZENE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 UJ	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
1,2,4-TRICHLOROBENZENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
1,2-DIPHENYLHYDRAZINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
1,3,5-TRINITROBENZENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
1,3-DINITROBENZENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
1,4-NAPHTHOQUINONE	170000 U	170000 U	180000 U	180000 U	180000 U	73000 R	73000 R	72000 U	190000 U	72000 U	72000 U	72000 U	34000 U
1-NAPHTHYLAMINE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 UJ	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
2,3,4,6-TETRACHLOROPHENOL	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 UJ	720 U	1900 U	720 U	720 U	720 U	340 U
2,4,5-TRICHLOROPHENOL	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
2,4,6-TRICHLOROPHENOL	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
2,4-DICHLOROPHENOL	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
2,4-DIMETHYLPHENOL	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
2,4-DINITROPHENOL	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
2,4-DINITROTOLUENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
2,6-DICHLOROPHENOL	1700 U	1700 U	1800 U	1800 U	1800 U	730 UJ	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
2,6-DINITROTOLUENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
2-ACETYLAMINOFLUORENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 UJ	730 UJ	720 U	1900 U	720 U	720 U	720 U	340 U
2-CHLORONAPHTHALENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
2-CHLOROPHENOL	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
2-METHYLNAPHTHALENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
2-METHYLPHENOL	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
2-NAPHTHYLAMINE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 UJ	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
2-NITROANILINE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
2-NITROPHENOL	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
2-PICOLINE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
3&4-METHYLPHENOL	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
3,3'-DICHLOROBENZIDINE	3500 U	3400 U	3600 U	3600 U	3700 U	1500 U	1500 U	1400 U	3700 U	1400 U	1400 U	1400 U	690 U
3,3'-DIMETHYLBENZIDINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 UJ	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
3-METHYLCHOLANTHRENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
3-NITROANILINE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
4,6-DINITRO-2-METHYLPHENOL	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
4-AMINOBIPHENYL	8600 U	8500 U	8900 U	8900 U	9100 U	3500 UJ	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
4-BROMOPHENYL PHENYL ETHER	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
4-CHLOROANILINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
4-CHLOROPHENYL PHENYL ETHER	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
4-NITROANILINE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
4-NITROPHENOL	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
4-NITROQUINOLINE-1-OXIDE	86000 U	85000 U	89000 U	89000 U	91000 U	35000 U	35000 UJ	35000 U	93000 U	35000 U	35000 U	35000 U	17000 U
5-NITRO-O-TOLUIDINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
7,12-DIMETHYLBENZ(A)ANTHRACENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
ACENAPHTHENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
ACENAPHTHYLENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
ACETOPHENONE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
ANILINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
ANTHRACENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
ARAMITE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
BENZIDINE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 UJ	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
BENZO(A)ANTHRACENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	37 J	170 J	720 U	720 U	720 U	340 U

TABLE A3-1
SMWU No. 17, Surface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-SS01	MPT-17-SS01	MPT-17-SS02	MPT-17-SS03	MPT-17-SS04	MPT-17-SS05	MPT-17-SS06	MPT-17-SS07	MPT-17-SS08	MPT-17-SS09	MPT-17-SS09	MPT-17-SS10	MPT-17-SS11
Sample ID	17S00101	17S00101D	17S00201	17S00301	17S00401	17S00501	17S00601	17S00701	17S00801	17S00901	17S00901D	17S01001	17S01101
Sample Date	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95	05/24/95	05/24/95	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95
BENZO(A)PYRENE	1700 U	1700 U	110 J	1800 U	1800 U	730 U	730 U	54 J	270 J	720 U	720 U	720 U	340 U
BENZO(B)FLUORANTHENE	1700 U	1700 U	120 J	1800 U	1800 U	730 U	730 U	61 J	280 J	720 U	720 U	720 U	340 U
BENZO(G,H,I)PERYLENE	1700 U	1700 U	120 J	1800 U	1800 U	730 UJ	730 U	77 J	360 J	720 U	720 U	720 U	340 U
BENZO(K)FLUORANTHENE	1700 U	1700 U	120 J	1800 U	1800 U	730 U	730 U	79 J	370 J	720 U	720 U	720 U	340 U
BENZOIC ACID	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
BENZYL ALCOHOL	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
BIS(2-CHLOROETHOXY)METHANE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
BIS(2-CHLOROETHYL)ETHER	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
BIS(2-CHLOROISOPROPYL) ETHER	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
BIS(2-ETHYLHEXYL)PHTHALATE	1700 U	1700 U	140 J	1800 U	1800 U	730 U	730 U	720 U	110 J	51 J	39 J	720 U	340 U
BUTYLBENZYL PHTHALATE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
CHLOROBENZILATE	520 U	520 U	220 U	1100 U	1100 U	22 U	22 U	110 U	110 U	22 U	22 U	22 U	21 U
CHRYSENE	1700 U	1700 U	120 J	1800 U	1800 U	730 U	730 U	59 J	290 J	720 U	720 U	720 U	340 U
DI-N-BUTYL PHTHALATE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	44 J	1900 U	39 J	720 U	720 U	20 J
DI-N-OCTYL PHTHALATE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
DIALLATE	1000 U	1000 U	430 U	2200 U	2200 U	44 U	44 U	220 U	220 U	43 U	43 U	43 U	41 U
DIBENZO(A,H)ANTHRACENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 UJ	730 U	720 U	140 J	720 U	720 U	720 U	340 U
DIBENZOFURAN	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
DIETHYL PHTHALATE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
DIMETHYL PHTHALATE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
ETHYL METHANESULFONATE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
FLUORANTHENE	1700 U	1700 U	150 J	1800 U	1800 U	180 J	730 U	71 J	360 J	47 J	45 J	720 U	340 U
FLUORENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
HEXACHLOROBENZENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
HEXACHLOROBUTADIENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
HEXACHLOROCYCLOPENTADIENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
HEXACHLOROETHANE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
HEXACHLOROPHENE	86000 U	85000 U	89000 U	89000 U	91000 U	35000 UJ	35000 R	35000 U	93000 U	35000 U	35000 U	35000 U	17000 U
HEXACHLOROPROPENE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 UJ	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
INDENO(1,2,3-CD)PYRENE	1700 U	1700 U	94 J	1800 U	1800 U	730 UJ	730 U	63 J	280 J	720 U	720 U	720 U	340 U
ISODRIN	17 U	17 U	7.2 U	36 U	37 U	0.74 U	0.73 U	3.6 U	3.7 U	0.72 U	0.72 U	0.72 U	0.69 U
ISOPHORONE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
ISOSAFROLE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
METHAPYRILENE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 UJ	3500 UJ	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
METHYL METHANESULFONATE	1700 U	1700 U	1800 U	1800 U	1800 U	730 UJ	730 UJ	720 U	1900 U	720 U	720 U	720 U	340 U
N-NITROSO-DI-N-PROPYLAMINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
N-NITROSODI-N-BUTYLAMINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
N-NITROSODIETHYLAMINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
N-NITROSODIMETHYLAMINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
N-NITROSODIPHENYLAMINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
N-NITROSOMETHYLETHYLAMINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
N-NITROSOMORPHOLINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
N-NITROSOPIPERIDINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
N-NITROSOPYRROLIDINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
NAPHTHALENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
NITROBENZENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
O-TOLUIDINE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
P-DIMETHYLAMINOAZOBENZENE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 UJ	720 U	1900 U	720 U	720 U	720 U	340 U
P-PHENYLENEDIAMINE	86000 U	85000 U	89000 U	89000 U	91000 U	35000 UJ	35000 UJ	35000 U	93000 U	35000 U	35000 U	35000 U	17000 U
PENTACHLOROBENZENE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 UJ	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
PENTACHLORONITROBENZENE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 UJ	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
PENTACHLOROPHENOL	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
PHENACETIN	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U
PHENANTHRENE	1700 U	1700 U	1800 U	1800 U	1800 U	95 J	730 U	720 U	1900 U	41 J	41 J	720 U	340 U
PHENOL	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 U	720 U	1900 U	720 U	720 U	720 U	340 U

TABLE A3-1
SMWU No. 17, Surface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-SS01	MPT-17-SS01	MPT-17-SS02	MPT-17-SS03	MPT-17-SS04	MPT-17-SS05	MPT-17-SS06	MPT-17-SS07	MPT-17-SS08	MPT-17-SS09	MPT-17-SS09	MPT-17-SS10	MPT-17-SS11
Sample ID	17S00101	17S00101D	17S00201	17S00301	17S00401	17S00501	17S00601	17S00701	17S00801	17S00901	17S00901D	17S01001	17S01101
Sample Date	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95	05/24/95	05/24/95	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95
PHENYL-TERT-BUTYLAMINE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 UJ	3500 UJ	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
PRONAMIDE	1700 U	1700 U	1800 U	1800 U	1800 U	730 U	730 UJ	720 U	1900 U	720 U	720 U	720 U	340 U
PYRENE	1700 U	1700 U	120 J	1800 U	1800 U	110 J	95 J	56 J	280 J	720 U	720 U	720 U	340 U
PYRIDINE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 U	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
SAFROLE	8600 U	8500 U	8900 U	8900 U	9100 U	3500 UJ	3500 U	3500 U	9300 U	3500 U	3500 U	3500 U	1700 U
Pesticides/PCBs (ug/kg)													
4,4'-DDD	34 U	34 U	14 U	70 U	71 U	12	1.5 J	7 U	7.3 U	1.4 U	1.4 U	1.4 U	1.3 U
4,4'-DDE	240	110	23 J	450	250	20	3.2	2.6 J	3.7 U	3.4	5.4	1	2.2
4,4'-DDT	54	31	25	93	77	1.4 U	1.4 U	4.2 J	7.3 U	1.3 J	1.6	1.2 J	1.3 J
ALDRIN	17 U	17 U	7.2 U	36 U	37 U	0.74 U	0.73 U	3.6 U	3.7 U	0.72 U	0.72 U	0.72 U	0.69 U
ALPHA-BHC	17 U	17 U	7.2 U	36 U	37 U	0.74 U	0.73 U	3.6 U	3.7 U	0.72 U	0.72 U	0.72 U	0.69 U
AROCLOR-1016	860 U	850 U	350 U	1800 U	1800 U	36 U	36 U	180 U	180 U	35 U	35 U	35 U	34 U
AROCLOR-1221	1700 U	1700 U	720 U	3600 U	3700 U	74 U	73 U	360 U	380 U	72 U	72 U	72 U	69 U
AROCLOR-1232	1700 U	1700 U	720 U	3600 U	3700 U	74 U	73 U	360 U	380 U	72 U	72 U	72 U	69 U
AROCLOR-1242	860 U	850 U	350 U	1800 U	1800 U	36 U	36 U	180 U	180 U	35 U	35 U	35 U	34 U
AROCLOR-1248	860 U	850 U	350 U	1800 U	1800 U	36 U	36 U	180 U	180 U	35 U	35 U	35 U	34 U
AROCLOR-1254	440 U	440 U	180 U	910 U	930 U	18 U	18 U	91 U	96 U	18 U	18 U	18 U	18 U
AROCLOR-1260	440 U	440 U	180 U	910 U	930 U	18 U	18 U	91 U	96 U	31	18	18 U	18 U
BETA-BHC	34 U	34 U	14 U	70 U	71 U	1.4 U	1.4 U	7 U	7.3 U	1.4 U	1.4 U	1.4 U	1.3 U
CHLORDANE	170 U	170 U	72 U	360 U	370 U	33	41	180	73 U	9.2 J	13 J	7.2 U	6.9 U
DELTA-BHC	17 U	17 U	7.2 U	36 U	37 U	0.74 U	0.73 U	3.6 U	3.7 U	0.72 U	0.72 U	0.72 U	0.69 U
DIELDRIN	17 U	17 U	11	36 U	37 U	0.74 U	0.73 U	3.6 U	3.7 U	0.72 U	0.72 U	0.72 U	0.69 U
ENDOSULFAN I	17 U	17 U	7.2 U	36 U	37 U	0.74 U	0.73 U	3.6 U	3.7 U	0.72 U	0.72 U	0.72 U	0.69 U
ENDOSULFAN II	34 U	34 U	14 U	70 U	71 U	1.4 U	1.4 U	7 U	7.3 U	1.4 U	1.4 U	1.4 U	1.3 U
ENDOSULFAN SULFATE	34 U	34 U	14 U	70 U	71 U	1.4 U	1.4 U	7 U	7.3 U	1.4 U	1.4 U	1.4 U	1.3 U
ENDRIN	34 U	34 U	14 U	70 U	71 U	1.4 U	1.4 U	7 U	7.3 U	1.4 U	1.4 U	1.4 U	1.3 U
ENDRIN ALDEHYDE	34 U	34 U	14 U	70 U	71 U	1.4 U	1.4 U	7 U	7.3 U	1.4 U	1.4 U	1.4 U	1.3 U
ENDRIN KETONE	34 U	34 U	14 U	70 U	71 U	1.4 U	1.4 U	7 U	7.3 U	1.4 U	1.4 U	1.4 U	1.3 U
GAMMA-BHC (LINDANE)	17 U	17 U	7.2 U	36 U	37 U	0.74 U	0.73 U	3.6 U	3.7 U	0.72 U	0.72 U	0.72 U	0.69 U
HEPTACHLOR	17 U	17 U	7.2 U	36 U	37 U	0.74 U	0.73 U	3.6 U	3.7 U	0.72 U	0.72 U	0.72 U	0.69 U
HEPTACHLOR EPOXIDE	17 U	17 U	7.2 U	36 U	37 U	0.74 U	0.73 U	3.6 U	3.7 U	0.72 U	0.72 U	0.72 U	0.69 U
KEPONE	210 UJ	210 UJ	86 UJ	430 UJ	220 UJ	44 UJ	44 UJ	43 UJ	45 UJ	43 UJ	43 UJ	43 UJ	41 UJ
METHOXYCHLOR	70 U	70 U	29 U	140 U	150 U	3 U	3 U	14 U	15 U	2.9 U	2.9 U	2.9 U	2.8 U
TOXAPHENE	860 U	850 U	350 U	1800 U	1800 U	36 U	36 U	180 U	180 U	35 U	35 U	35 U	34 U
Inorganics (mg/kg)													
ALUMINUM	1660	1860	1410	1480	1000			2450	1430	872	867	2900	447
ANTIMONY	0.82 UJ	0.99 J	1.6 J	0.87 J	2.1 J	1.1 U	1.1 U	1 J	2.1 J	2.5 J	0.82 UJ	0.91 J	0.43 UJ
ARSENIC	1.4 J	0.73 J	0.64 J	0.81 J	0.83 J	0.9 J	0.74 J	1.8 J	0.98 J	0.39 J	0.57 J	0.33 J	0.4 J
BARIUM	25 J	17.4 J	21.8 J	13.1 J	25.4 J	8.4 J	9.7 J	12.5 J	21.3 J	14.5 J	15.5 J	14.3 J	5.1 J
BERYLLIUM	0.07 J	0.07 J	0.04 J	0.04 J	0.03 UJ	0.13 J	0.15 J	0.07 J	0.04 J	0.03 UJ	0.03 UJ	0.03 UJ	0.03 UJ
CADMIUM	0.52 U	0.52 U	0.53 U	0.53 U	0.54 U	0.32 J	0.26 U	0.77 J	1.2	0.53 U	0.68 J	0.54 U	0.51 U
CALCIUM	30500	34900	27200	29900	133000			69800	273000	15600	60500	6970	10400
CHROMIUM	6.7 J	6.8 J	20.2 J	6.7 J	7.8 J	7.1	7	7.6 J	11.2 J	4.9 J	5 J	5.6 J	3 J
COBALT	0.97 UJ	0.97 UJ	0.99 UJ	1.6 J	1.1 J	0.68 U	0.68 U	1 UJ	1.1 J	1 UJ	1 UJ	1 UJ	1.1 J
COPPER	12.4 J	8.8 J	14.3 J	9.1 J	18.4 J	4.4 J	3.5 UJ	14.6 J	16.8 J	13.5 J	12.9 J	8.4 J	3.4 J
CYANIDE	0.1 U	0.1 U	0.25 J	0.11 U	0.11 U	0.09 J	0.05 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.1 U
IRON	2460	2090	3150	1960	2440			3320	1590	896	881	541	560
LEAD	110	118	252	144	104	42.3	16.2	29.8 J	19.3 J	13.2 J	15.6 J	10.5 J	8.6
MAGNESIUM	555 J	644 J	687 J	573 J	1120			1320	1850	225 J	525 J	114 J	131 J
MANGANESE	52.9 J	55.1 J	60.9 J	41.7 J	43.2 J			78.6 J	38.3 J	13.1 J	17 J	8.6 J	11.4 J
MERCURY	0.03 U	0.04 J	0.03 J	0.04 J	0.04 J	0.06 U	0.03 U	0.03 J	0.14	0.05 J	0.05 J	0.03 U	0.03 U
NICKEL	2.3 UJ	1.1 U	10.4	4 UJ	3.4 UJ	1.7 UJ	2.6 UJ	2.2 UJ	3 UJ	1.1 U	1.3 UJ	2.3 UJ	1 U
SELENIUM	0.26 J	0.23 U	0.23 U	0.23 U	0.24 U	0.11 J	0.11 UJ	0.24 U	0.25 U	0.23 U	0.3 J	0.44 J	0.22 U
SILVER	0.48 U	0.48 U	0.48 U	0.49 U	0.5 U	0.31 U	0.31 U	0.5 U	0.52 U	0.49 U	0.49 U	0.49 U	0.47 U

TABLE A3-1
SMWU No. 17, Surface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-SS01	MPT-17-SS01	MPT-17-SS02	MPT-17-SS03	MPT-17-SS04	MPT-17-SS05	MPT-17-SS06	MPT-17-SS07	MPT-17-SS08	MPT-17-SS09	MPT-17-SS09	MPT-17-SS10	MPT-17-SS11
Sample ID	17S00101	17S00101D	17S00201	17S00301	17S00401	17S00501	17S00601	17S00701	17S00801	17S00901	17S00901D	17S01001	17S01101
Sample Date	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95	05/24/95	05/24/95	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95	04/11/95
SODIUM	262 J	282 J	189 J	291 J	715 J			515 J	177 J	87.2 J	467 J	95.4 J	150 J
THALLIUM	0.35 U	0.35 U	0.36 U	0.36 U	0.37 U	0.13 U	0.13 U	0.37 U	0.38 U	0.36 U	0.36 U	0.36 U	0.35 U
TIN	3.5 J	69	3.2 J	1.6 U	2.1 J	3 U	3 U	2.3 J	2 J	6.1 J	1.6 U	2.3 J	2 J
VANADIUM	7.2 J	7.1 J	7.3 J	10.1 J	8.2 J	6.2 J	8.3 J	12.2 J	13.5 J	3.5 J	3.1 J	3 J	3.1 J
ZINC	56.2	52	91.2	55.6	86.8	32	16	73.5	65.8	41.5	42.6	26.6	12.1

TABLE A3-1
SMWU No. 17, Surface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-SS12	MPT-17-MW01S	MPT-17-MW02S	MPT-17-MW03S
Sample ID	17S01201	17S01301	17S01401	17S01501
Sample Date	04/11/95	05/23/95	05/23/95	05/24/95
Volatile Organics (ug/kg)				
1,1,1,2-TETRACHLOROETHANE	5 U	5 U	5 U	5 U
1,1,1-TRICHLOROETHANE	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROPROPANE	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	11 U	10 U	11 U	11 U
1,2-DICHLOROBENZENE	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5 U	5 U	5 U	5 U
1,2-DICHLOROETHENE (TOTAL)	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5 U	5 U	5 U	5 U
1,4-DIOXANE	210 R	210 R	210 R	220 R
2-BUTANONE	11 U	10 U	11 U	6 J
2-CHLOROETHYL VINYL ETHER	11 U	10 U	11 U	11 U
2-HEXANONE	11 U	10 U	11 U	11 U
3-CHLOROPROPENE	5 U	5 U	5 U	5 U
4-CHLORO-3-METHYLPHENOL	710 U	710 U	720 U	730 U
4-METHYL-2-PENTANONE	11 U	10 U	11 U	11 U
ACETONE	11 U	10 U	11 U	32 U
ACETONITRILE	110 U	100 U	110 U	110 U
ACROLEIN	110 UJ	100 U	110 U	110 U
ACRYLONITRILE	110 UJ	100 U	110 U	110 U
BENZENE	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5 U	5 U	5 U	5 U
BROMOFORM	5 U	5 U	5 U	5 U
BROMOMETHANE	11 U	10 U	11 U	11 U
CARBON DISULFIDE	1 J	5 U	5 U	5 U
CARBON TETRACHLORIDE	5 U	5 U	5 U	5 U
CHLOROBENZENE	5 U	5 U	5 U	5 U
CHLOROETHANE	11 U	10 U	11 U	11 U
CHLOROFORM	5 U	5 U	5 U	5 U
CHLOROMETHANE	11 U	10 U	11 U	11 U
CHLOROPRENE	210 U	210 U	210 U	220 U
CIS-1,3-DICHLOROPROPENE	5 U	5 U	5 U	5 U
DIBROMOCHLOROMETHANE	5 U	5 U	5 U	5 U
DIBROMOMETHANE	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	11 U	10 U	11 U	11 U
ETHYL METHACRYLATE	5 U	5 U	5 U	5 U
ETHYLBENZENE	5 U	5 U	5 U	5 U
ETHYLENE DIBROMIDE	5 U	5 U	5 U	5 U
IODOMETHANE	11 U	10 UJ	11 UJ	11 UJ
ISOBUTYL ALCOHOL	210 U	210 U	210 U	220 U
METHACRYLONITRILE	5 U	5 U	5 U	5 U
METHYL METHACRYLATE	11 U	10 U	11 U	11 U
METHYLENE CHLORIDE	13 U	5 U	5 U	5 U
PENTACHLOROETHANE	11 U	10 UJ	11 UJ	11 UJ
PROPIONITRILE	110 U	100 U	110 U	110 U
STYRENE	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5 U	5 U	5 U	5 U
TOLUENE	1 J	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5 U	5 U	5 U	5 U

TABLE A3-1
SMWU No. 17, Surface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-SS12	MPT-17-MW01S	MPT-17-MW02S	MPT-17-MW03S
Sample ID	17S01201	17S01301	17S01401	17S01501
Sample Date	04/11/95	05/23/95	05/23/95	05/24/95
TRANS-1,4-DICHLORO-2-BUTENE	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5 U	5 U	5 U	5 U
TRICHLOROFLUOROMETHANE	5 U	5 U	5 U	5 U
VINYL ACETATE	11 U	10 U	11 U	11 U
VINYL CHLORIDE	11 U	10 U	11 U	11 U
XYLENES, TOTAL	5 U	1 J	2 J	2 J
Semivolatile Organics (ug/kg)				
1,2,4,5-TETRACHLOROBENZENE	3500 U	3400 UJ	3500 UJ	3600 U
1,2,4-TRICHLOROBENZENE	710 U	710 U	720 U	730 U
1,2-DIPHENYLHYDRAZINE	710 U	710 U	720 U	730 U
1,3,5-TRINITROBENZENE	710 U	710 U	720 U	730 U
1,3-DINITROBENZENE	710 U	710 U	720 U	730 U
1,4-NAPHTHOQUINONE	71000 U	71000 R	72000 R	73000 R
1-NAPHTHYLAMINE	3500 U	3400 U	3500 U	3600 UJ
2,3,4,6-TETRACHLOROPHENOL	710 U	710 UJ	720 UJ	730 U
2,4,5-TRICHLOROPHENOL	3500 U	3400 U	3500 U	3600 U
2,4,6-TRICHLOROPHENOL	710 U	710 U	720 U	730 U
2,4-DICHLOROPHENOL	710 U	710 U	720 U	730 U
2,4-DIMETHYLPHENOL	710 U	710 U	720 U	730 U
2,4-DINITROPHENOL	3500 U	3400 U	3500 U	3600 U
2,4-DINITROTOLUENE	710 U	710 U	720 U	730 U
2,6-DICHLOROPHENOL	710 U	710 U	720 U	730 UJ
2,6-DINITROTOLUENE	710 U	710 U	720 U	730 U
2-ACETYLAMINOFLUORENE	710 U	710 UJ	720 UJ	730 UJ
2-CHLORONAPHTHALENE	710 U	710 U	720 U	730 U
2-CHLOROPHENOL	710 U	710 U	720 U	730 U
2-METHYLNAPHTHALENE	710 U	710 U	720 U	730 U
2-METHYLPHENOL	710 U	710 U	720 U	730 U
2-NAPHTHYLAMINE	3500 U	3400 U	3500 U	3600 UJ
2-NITROANILINE	3500 U	3400 U	3500 U	3600 U
2-NITROPHENOL	710 U	710 U	720 U	730 U
2-PICOLINE	3500 U	3400 U	3500 U	3600 U
3&4-METHYLPHENOL	710 U	710 U	720 U	730 U
3,3'-DICHLOROBENZIDINE	1400 U	1400 U	1400 U	1500 U
3,3'-DIMETHYLBENZIDINE	710 U	710 U	720 U	730 UJ
3-METHYLCHOLANTHRENE	710 U	710 U	720 U	730 U
3-NITROANILINE	3500 U	3400 U	3500 U	3600 U
4,6-DINITRO-2-METHYLPHENOL	3500 U	3400 U	3500 U	3600 U
4-AMINOBIPHENYL	3500 U	3400 U	3500 U	3600 UJ
4-BROMOPHENYL PHENYL ETHER	710 U	710 U	720 U	730 U
4-CHLOROANILINE	710 U	710 U	720 U	730 U
4-CHLOROPHENYL PHENYL ETHER	710 U	710 U	720 U	730 U
4-NITROANILINE	3500 U	3400 U	3500 U	3600 U
4-NITROPHENOL	3500 U	3400 U	3500 U	3600 U
4-NITROQUINOLINE-1-OXIDE	35000 U	34000 UJ	35000 UJ	36000 U
5-NITRO-O-TOLUIDINE	710 U	710 U	720 U	730 U
7,12-DIMETHYLBENZ(A)ANTHRACENE	710 U	710 U	720 U	730 U
ACENAPHTHENE	710 U	710 U	720 U	730 U
ACENAPHTHYLENE	710 U	710 U	720 U	730 U
ACETOPHENONE	710 U	710 U	720 U	730 U
ANILINE	710 U	710 U	720 U	730 U
ANTHRACENE	710 U	710 U	720 U	730 U
ARAMITE	3500 U	3400 U	3500 U	3600 U
BENZIDINE	3500 U	3400 UJ	3500 UJ	3600 U
BENZO(A)ANTHRACENE	710 U	710 U	720 U	730 U

TABLE A3-1
SMWU No. 17, Surface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-SS12	MPT-17-MW01S	MPT-17-MW02S	MPT-17-MW03S
Sample ID	17S01201	17S01301	17S01401	17S01501
Sample Date	04/11/95	05/23/95	05/23/95	05/24/95
BENZO(A)PYRENE	710 U	710 U	720 U	730 U
BENZO(B)FLUORANTHENE	710 U	710 U	720 U	730 U
BENZO(G,H,I)PERYLENE	710 U	710 U	720 U	730 UJ
BENZO(K)FLUORANTHENE	710 U	710 U	720 U	730 U
BENZOIC ACID	3500 U	3400 U	3500 U	3600 U
BENZYL ALCOHOL	710 U	710 U	720 U	730 U
BIS(2-CHLOROETHOXY)METHANE	710 U	710 U	720 U	730 U
BIS(2-CHLOROETHYL)ETHER	710 U	710 U	720 U	730 U
BIS(2-CHLOROISOPROPYL) ETHER	710 U	710 U	720 U	730 U
BIS(2-ETHYLHEXYL)PHTHALATE	710 U	710 U	720 U	730 U
BUTYLBENZYL PHTHALATE	710 U	710 U	720 U	730 U
CHLOROBENZILATE	1100 U	21 U	44 U	22 U
CHRYSENE	710 U	710 U	720 U	730 U
DI-N-BUTYL PHTHALATE	710 U	710 U	720 U	730 U
DI-N-OCTYL PHTHALATE	710 U	710 U	720 U	730 U
DIALLATE	2100 U	43 U	87 U	44 U
DIBENZO(A,H)ANTHRACENE	710 U	710 U	720 U	730 UJ
DIBENZOFURAN	710 U	710 U	720 U	730 U
DIETHYL PHTHALATE	710 U	710 U	720 U	730 U
DIMETHYL PHTHALATE	710 U	710 U	720 U	730 U
ETHYL METHANESULFONATE	710 U	710 U	720 U	730 U
FLUORANTHENE	710 U	710 U	720 U	730 U
FLUORENE	710 U	710 U	720 U	730 U
HEXACHLOROBENZENE	710 U	710 U	720 U	730 U
HEXACHLOROBUTADIENE	710 U	710 U	720 U	730 U
HEXACHLOROCYCLOPENTADIENE	710 U	710 U	720 U	730 U
HEXACHLOROETHANE	710 U	710 U	720 U	730 U
HEXACHLOROPHENE	35000 U	34000 R	35000 R	36000 UJ
HEXACHLOROPROPENE	3500 U	3400 UJ	3500 UJ	3600 U
INDENO(1,2,3-CD)PYRENE	710 U	710 U	720 U	730 UJ
ISODRIN	36 U	0.72 U	1.5 U	0.74 U
ISOPHORONE	710 U	710 U	720 U	730 U
ISOSAFROLE	3500 U	3400 U	3500 U	3600 U
METHAPYRILENE	3500 U	3400 UJ	3500 UJ	3600 UJ
METHYL METHANESULFONATE	710 U	710 UJ	720 UJ	730 UJ
N-NITROSO-DI-N-PROPYLAMINE	710 U	710 U	720 U	730 U
N-NITROSODI-N-BUTYLAMINE	710 U	710 U	720 U	730 U
N-NITROSODIETHYLAMINE	710 U	710 U	720 U	730 U
N-NITROSODIMETHYLAMINE	710 U	710 U	720 U	730 U
N-NITROSODIPHENYLAMINE	710 U	710 U	720 U	730 U
N-NITROSOMETHYLETHYLAMINE	710 U	710 U	720 U	730 U
N-NITROSOMORPHOLINE	710 U	710 U	720 U	730 U
N-NITROSOPIPERIDINE	710 U	710 U	720 U	730 U
N-NITROSOPYRROLIDINE	710 U	710 U	720 U	730 U
NAPHTHALENE	710 U	710 U	720 U	210 J
NITROBENZENE	710 U	710 U	720 U	730 U
O-TOLUIDINE	710 U	710 U	720 U	730 U
P-DIMETHYLAMINOAZOBENZENE	710 U	710 UJ	720 UJ	730 U
P-PHENYLENEDIAMINE	35000 U	34000 UJ	35000 UJ	36000 UJ
PENTACHLOROBENZENE	3500 U	3400 UJ	3500 UJ	3600 U
PENTACHLORONITROBENZENE	3500 U	3400 UJ	3500 UJ	3600 U
PENTACHLOROPHENOL	3500 U	3400 U	3500 U	3600 U
PHENACETIN	710 U	710 U	720 U	730 U
PHENANTHRENE	710 U	710 U	720 U	730 U
PHENOL	710 U	710 U	720 U	730 U

TABLE A3-1
SMWU No. 17, Surface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-SS12	MPT-17-MW01S	MPT-17-MW02S	MPT-17-MW03S
Sample ID	17S01201	17S01301	17S01401	17S01501
Sample Date	04/11/95	05/23/95	05/23/95	05/24/95
PHENYL-TERT-BUTYLAMINE	3500 U	3400 UJ	3500 UJ	3600 UJ
PRONAMIDE	710 U	710 UJ	720 UJ	730 U
PYRENE	710 U	710 U	720 U	730 U
PYRIDINE	3500 U	3400 U	3500 U	3600 U
SAFROLE	3500 U	3400 U	3500 U	3600 UJ
Pesticides/PCBs (ug/kg)				
4,4'-DDD	69 U	1.4 U	4.4 J	1.4 U
4,4'-DDE	520	9.2	200	0.74 U
4,4'-DDT	220	3.7	130	1.4 U
ALDRIN	36 U	0.72 U	1.5 U	0.74 U
ALPHA-BHC	36 U	0.72 U	1.5 U	0.74 U
AROCLOR-1016	1800 U	35 U	72 U	37 U
AROCLOR-1221	3600 U	72 U	150 U	74 U
AROCLOR-1232	3600 U	72 U	150 U	74 U
AROCLOR-1242	1800 U	35 U	72 U	37 U
AROCLOR-1248	1800 U	35 U	72 U	37 U
AROCLOR-1254	900 U	17 U	35 U	18 U
AROCLOR-1260	900 U	17 U	35 U	18 U
BETA-BHC	69 U	1.4 U	2.8 U	1.4 U
CHLORDANE	360 U	27	30 J	27 J
DELTA-BHC	36 U	0.72 U	1.5 U	0.74 U
DIELDRIN	36 U	0.72 U	1.5 U	0.74 U
ENDOSULFAN I	36 U	0.72 U	1.5 U	0.74 U
ENDOSULFAN II	69 U	1.4 U	2.8 U	1.4 U
ENDOSULFAN SULFATE	69 U	1.4 U	2.8 U	1.4 U
ENDRIN	69 U	1.4 U	2.8 U	3.5
ENDRIN ALDEHYDE	69 U	1.4 U	2.8 U	1.4 U
ENDRIN KETONE	69 U	1.4 U	2.8 U	1.4 U
GAMMA-BHC (LINDANE)	36 U	0.72 U	1.5 U	0.74 U
HEPTACHLOR	36 U	0.72 U	1.5 U	0.74 U
HEPTACHLOR EPOXIDE	36 U	0.72 U	1.5 U	0.74 U
KEPONE	430 UJ	43 UJ	44 UJ	44 UJ
METHOXYCHLOR	140 U	2.9 U	5.9 U	3 U
TOXAPHENE	1800 U	35 U	72 U	37 U
Inorganics (mg/kg)				
ALUMINUM	382			
ANTIMONY	0.45 UJ	1.1 U	1.1 U	1.1 U
ARSENIC	0.16 U	0.39 J	0.54 J	0.73 J
BARIUM	5 J	14.2 J	12.9 J	14 J
BERYLLIUM	0.03 UJ	0.15 J	0.17 J	0.17 J
CADMIUM	0.54 U	0.26 U	0.26 U	0.27 U
CALCIUM	4220			
CHROMIUM	1.9 J	6.4	7.5	7.1
COBALT	1 UJ	0.67 U	0.96 J	0.88 J
COPPER	1.6 J	2 UJ	5.7	1.7 UJ
CYANIDE	0.11 U	0.05 U	0.05 U	0.09 J
IRON	474			
LEAD	64.3 J	6.8	8.1	5
MAGNESIUM	74 J			
MANGANESE	39.6 J			
MERCURY	0.03 U	0.03 U	0.03 U	0.06 U
NICKEL	2 UJ	1.6 UJ	3 UJ	2.9 UJ
SELENIUM	0.23 U	0.11 UJ	0.11 UJ	0.11 UJ
SILVER	0.49 U	0.3 U	0.31 U	0.31 U

TABLE A3-1
SMWU No. 17, Surface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-SS12	MPT-17-MW01S	MPT-17-MW02S	MPT-17-MW03S
Sample ID	17S01201	17S01301	17S01401	17S01501
Sample Date	04/11/95	05/23/95	05/23/95	05/24/95
SODIUM	92.8 J			
THALLIUM	0.36 U	0.13 U	0.13 U	0.13 U
TIN	1.6 U	3.6 J	3 U	3 U
VANADIUM	7.3 J	6.8 J	8.1 J	8.5 J
ZINC	32.9	5.6	10.8	7.5

TABLE A3-2
SWMU No. 17, Subsurface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-MW03S	MPT-17-MW01S	MPT-17-MW02S	MPT-17-MW03S	MPT-17-MW03S
Sample ID	17B00307	17B01305	17B01405	17B01505	17B01505D
Sample Date	05/24/95	05/23/95	05/23/95	05/24/95	05/24/95
Volatile Organics (ug/kg)					
1,1,1,2-TETRACHLOROETHANE		6 U	6 U	6 U	6 U
1,1,1-TRICHLOROETHANE		6 U	6 U	6 U	6 U
1,1,2,2-TETRACHLOROETHANE		6 U	6 U	6 U	6 U
1,1,2-TRICHLOROETHANE		6 U	6 U	6 U	6 U
1,1-DICHLOROETHANE		6 U	6 U	6 U	6 U
1,1-DICHLOROETHENE		6 U	6 U	6 U	6 U
1,2,3-TRICHLOROPROPANE		6 U	6 U	6 U	6 U
1,2-DIBROMO-3-CHLOROPROPANE		11 U	13 U	12 U	12 U
1,2-DICHLOROBENZENE		6 U	6 U	6 U	6 U
1,2-DICHLOROETHANE		6 U	6 U	6 U	6 U
1,2-DICHLOROETHENE (TOTAL)		6 U	6 U	6 U	6 U
1,2-DICHLOROPROPANE		6 U	6 U	6 U	6 U
1,3-DICHLOROBENZENE		6 U	6 U	6 U	6 U
1,4-DICHLOROBENZENE		6 U	6 U	6 U	6 U
1,4-DIOXANE		230 R	260 R	240 R	240 R
2-BUTANONE		11 U	13 U	12 U	6 J
2-CHLOROETHYL VINYL ETHER		11 U	13 U	12 U	12 U
2-HEXANONE		11 U	13 U	12 U	12 U
3-CHLOROPROPENE		6 U	6 U	6 U	6 U
4-CHLORO-3-METHYLPHENOL		730 U	850 U	810 U	790 U
4-METHYL-2-PENTANONE		11 U	13 U	12 U	12 U
ACETONE		11 U	13 U	12 U	27 U
ACETONITRILE		110 U	130 U	120 U	120 U
ACROLEIN		110 U	130 U	120 U	120 U
ACRYLONITRILE		110 U	130 U	120 U	120 U
BENZENE		6 U	6 U	6 U	6 U
BROMODICHLOROMETHANE		6 U	6 U	6 U	6 U
BROMOFORM		6 U	6 U	6 U	6 U
BROMOMETHANE		11 U	13 U	12 UJ	12 U
CARBON DISULFIDE		6 U	6 U	3 J	6 U
CARBON TETRACHLORIDE		6 U	6 U	6 U	6 U
CHLOROBENZENE		6 U	6 U	6 U	6 U
CHLOROETHANE		11 U	13 U	12 U	12 U
CHLOROFORM		6 U	6 U	6 U	6 U
CHLOROMETHANE		11 U	13 U	12 U	12 U
CHLOROPRENE		230 U	260 U	240 U	240 U
CIS-1,3-DICHLOROPROPENE		6 U	6 U	6 U	6 U
DIBROMOCHLOROMETHANE		6 U	6 U	6 U	6 U
DIBROMOMETHANE		6 U	6 U	6 U	6 U
DICHLORODIFLUOROMETHANE		11 U	13 U	12 U	12 U
ETHYL METHACRYLATE		6 U	6 U	6 U	6 U
ETHYLBENZENE		6 U	6 U	6 U	6 U
ETHYLENE DIBROMIDE		6 U	6 U	6 U	6 U
IODOMETHANE		11 UJ	13 UJ	12 UJ	12 UJ
ISOBUTYL ALCOHOL		230 U	260 U	240 U	240 U
METHACRYLONITRILE		6 U	6 U	6 U	6 U
METHYL METHACRYLATE		11 U	13 U	12 U	12 U
METHYLENE CHLORIDE		6 U	8 U	6 U	6 U
PENTACHLOROETHANE		11 UJ	13 UJ	12 U	12 UJ
PROPIONITRILE		110 U	130 U	120 U	120 U
STYRENE		6 U	6 U	6 U	6 U
TETRACHLOROETHENE		6 U	6 U	6 U	6 U
TOLUENE		6 U	2 J	6 U	6 U
TRANS-1,3-DICHLOROPROPENE		6 U	6 U	6 U	6 U
TRANS-1,4-DICHLORO-2-BUTENE		6 U	6 U	6 U	6 U
TRICHLOROETHENE		6 U	6 U	6 U	6 U
TRICHLOROFLUOROMETHANE		6 U	6 U	6 U	6 U
VINYL ACETATE		11 U	13 U	12 U	12 U
VINYL CHLORIDE		11 U	13 U	12 U	12 U
XYLENES, TOTAL		2 J	2 J	3 J	2 J
Semivolatile Organics (ug/kg)					
1,2,4,5-TETRACHLOROBENZENE		3600 UJ	4100 UJ	4000 UJ	3800 UJ
1,2,4-TRICHLOROBENZENE		730 U	850 U	810 U	790 U
1,2-DIPHENYLHYDRAZINE		730 U	850 U	810 U	790 U
1,3,5-TRINITROBENZENE		730 U	850 U	810 U	790 U
1,3-DINITROBENZENE		730 U	850 U	810 U	790 U
1,4-NAPHTHOQUINONE		73000 R	85000 R	81000 R	79000 R
1-NAPHTHYLAMINE		3600 U	4100 U	4000 U	3800 U
2,3,4,6-TETRACHLOROPHENOL		730 UJ	850 UJ	810 UJ	790 UJ
2,4,5-TRICHLOROPHENOL		3600 U	4100 U	4000 U	3800 U
2,4,6-TRICHLOROPHENOL		730 U	850 U	810 U	790 U
2,4-DICHLOROPHENOL		730 U	850 U	810 U	790 U
2,4-DIMETHYLPHENOL		730 U	850 U	810 U	790 U
2,4-DINITROPHENOL		3600 U	4100 U	4000 U	3800 U
2,4-DINITROTOLUENE		730 U	850 U	810 U	790 U
2,6-DICHLOROPHENOL		730 U	850 U	810 U	790 U

TABLE A3-2
SWMU No. 17, Subsurface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-MW03S	MPT-17-MW01S	MPT-17-MW02S	MPT-17-MW03S	MPT-17-MW03S
Sample ID	17B00307	17B01305	17B01405	17B01505	17B01505D
Sample Date	05/24/95	05/23/95	05/23/95	05/24/95	05/24/95
2,6-DINITROTOLUENE		730 U	850 U	810 U	790 U
2-ACETYLAMINOFLUORENE		730 UJ	850 UJ	810 UJ	790 UJ
2-CHLORONAPHTHALENE		730 U	850 U	810 U	790 U
2-CHLOROPHENOL		730 U	850 U	810 U	790 U
2-METHYLNAPHTHALENE		730 U	850 U	170 J	130 J
2-METHYLPHENOL		730 U	850 U	810 U	790 U
2-NAPHTHYLAMINE		3600 U	4100 U	4000 U	3800 U
2-NITROANILINE		3600 U	4100 U	4000 U	3800 U
2-NITROPHENOL		730 U	850 U	810 U	790 U
2-PICOLINE		3600 U	4100 U	4000 U	3800 U
3&4-METHYLPHENOL		730 U	850 U	810 U	790 U
3,3'-DICHLOROBENZIDINE		1500 U	1700 U	1600 U	1600 U
3,3'-DIMETHYLBENZIDINE		730 U	850 U	810 U	790 U
3-METHYLCHOLANTHRENE		730 U	850 U	810 U	790 U
3-NITROANILINE		3600 U	4100 U	4000 U	3800 U
4,6-DINITRO-2-METHYLPHENOL		3600 U	4100 U	4000 U	3800 U
4-AMINOBIPHENYL		3600 U	4100 U	4000 U	3800 U
4-BROMOPHENYL PHENYL ETHER		730 U	850 U	810 U	790 U
4-CHLOROANILINE		730 U	850 U	810 U	790 U
4-CHLOROPHENYL PHENYL ETHER		730 U	850 U	810 U	790 U
4-NITROANILINE		3600 U	4100 U	4000 U	3800 U
4-NITROPHENOL		3600 U	4100 U	4000 U	3800 U
4-NITROQUINOLINE-1-OXIDE		36000 UJ	41000 UJ	40000 UJ	38000 UJ
5-NITRO-O-TOLUIDINE		730 U	850 U	810 U	790 U
7,12-DIMETHYLBENZ(A)ANTHRACENE		730 U	850 U	810 U	790 U
ACENAPHTHENE		730 U	850 U	810 U	790 U
ACENAPHTHYLENE		730 U	850 U	810 U	790 U
ACETOPHENONE		730 U	850 U	810 U	790 U
ANILINE		730 U	850 U	810 U	790 U
ANTHRACENE		730 U	850 U	810 U	790 U
ARAMITE		3600 U	4100 U	4000 U	3800 U
BENZIDINE		3600 UJ	4100 UJ	4000 UJ	3800 UJ
BENZO(A)ANTHRACENE		730 U	850 U	810 U	790 U
BENZO(A)PYRENE		730 U	850 U	810 U	790 U
BENZO(B)FLUORANTHENE		730 U	850 U	810 U	790 U
BENZO(G,H,I)PERYLENE		730 U	850 U	810 U	790 U
BENZO(K)FLUORANTHENE		730 U	850 U	810 U	790 U
BENZOIC ACID		3600 U	4100 U	4000 U	3800 U
BENZYL ALCOHOL		730 U	850 U	810 U	790 U
BIS(2-CHLOROETHOXY)METHANE		730 U	850 U	810 U	790 U
BIS(2-CHLOROETHYL)ETHER		730 U	850 U	810 U	790 U
BIS(2-CHLOROISOPROPYL) ETHER		730 U	850 U	810 U	790 U
BIS(2-ETHYLHEXYL)PHTHALATE		730 U	850 U	810 U	790 U
BUTYLBENZYL PHTHALATE		730 U	850 U	810 U	790 U
CHLOROBENZILATE		22 U	26 U	49 U	48 U
CHRYSENE		730 U	850 U	810 U	790 U
DI-N-BUTYL PHTHALATE		730 U	850 U	810 U	790 U
DI-N-OCTYL PHTHALATE		730 U	850 U	810 U	790 U
DIALLATE		45 U	51 U	99 U	95 U
DIBENZO(A,H)ANTHRACENE		730 U	850 U	810 U	790 U
DIBENZOFURAN		730 U	850 U	810 U	790 U
DIETHYL PHTHALATE		730 U	850 U	810 U	790 U
DIMETHYL PHTHALATE		730 U	850 U	810 U	790 U
ETHYL METHANESULFONATE		730 U	850 U	810 U	790 U
FLUORANTHENE		730 U	850 U	810 U	790 U
FLUORENE		730 U	850 U	810 U	790 U
HEXACHLOROBENZENE		730 U	850 U	810 U	790 U
HEXACHLOROBUTADIENE		730 U	850 U	810 U	790 U
HEXACHLOROCYCLOPENTADIENE		730 U	850 U	810 U	790 U
HEXACHLOROETHANE		730 U	850 U	810 U	790 U
HEXACHLOROPHENE		36000 R	41000 R	40000 R	38000 R
HEXACHLOROPROPENE		3600 UJ	4100 UJ	4000 UJ	3800 UJ
INDENO(1,2,3-CD)PYRENE		730 U	850 U	810 U	790 U
ISODRIN		0.75 U	0.86 U	1.7 U	1.6 U
ISOPHORONE		730 U	850 U	810 U	790 U
ISOSAFROLE		3600 U	4100 U	4000 U	3800 U
METHAPYRILENE		3600 UJ	4100 UJ	4000 UJ	3800 UJ
METHYL METHANESULFONATE		730 UJ	850 UJ	810 UJ	790 UJ
N-NITROSO-DI-N-PROPYLAMINE		730 U	850 U	810 U	790 U
N-NITROSODI-N-BUTYLAMINE		730 U	850 U	810 U	790 U
N-NITROSODIETHYLAMINE		730 U	850 U	810 U	790 U
N-NITROSODIMETHYLAMINE		730 U	850 U	810 U	790 U
N-NITROSODIPHENYLAMINE		730 U	850 U	810 U	790 U
N-NITROSOMETHYLETHYLAMINE		730 U	850 U	810 U	790 U
N-NITROSOMORPHOLINE		730 U	850 U	810 U	790 U
N-NITROSOPIPERIDINE		730 U	850 U	810 U	790 U
N-NITROSOPYRROLIDINE		730 U	850 U	810 U	790 U

TABLE A3-2
SWMU No. 17, Subsurface Soil - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-MW03S	MPT-17-MW01S	MPT-17-MW02S	MPT-17-MW03S	MPT-17-MW03S
Sample ID	17B00307	17B01305	17B01405	17B01505	17B01505D
Sample Date	05/24/95	05/23/95	05/23/95	05/24/95	05/24/95
NAPHTHALENE		730 U	850 U	810 U	790 U
NITROBENZENE		730 U	850 U	810 U	790 U
O-TOLUIDINE		730 U	850 U	810 U	790 U
P-DIMETHYLAMINOAZOBENZENE		730 UJ	850 UJ	810 UJ	790 UJ
P-PHENYLENEDIAMINE		36000 UJ	41000 UJ	40000 UJ	38000 UJ
PENTACHLOROBENZENE		3600 UJ	4100 UJ	4000 UJ	3800 UJ
PENTACHLORONITROBENZENE		3600 UJ	4100 UJ	4000 UJ	3800 UJ
PENTACHLOROPHENOL		3600 U	4100 U	4000 U	3800 U
PHENACETIN		730 U	850 U	810 U	790 U
PHENANTHRENE		730 U	850 U	810 U	790 U
PHENOL		730 U	850 U	810 U	790 U
PHENYL-TERT-BUTYLAMINE		3600 UJ	4100 UJ	4000 UJ	3800 UJ
PRONAMIDE		730 UJ	850 UJ	810 UJ	790 UJ
PYRENE		730 U	850 U	810 U	790 U
PYRIDINE		3600 U	4100 U	4000 U	3800 U
SAFROLE		3600 U	4100 U	4000 U	3800 U
Pesticides/PCBs (ug/kg)					
4,4'-DDD		1.5 U	4.7	53	65
4,4'-DDE		0.75 U	16	1.7 U	180
4,4'-DDT		1.5 U	4.1	3.2 U	3.1 U
ALDRIN		0.75 U	0.86 U	1.7 U	1.6 U
ALPHA-BHC		0.75 U	0.86 U	1.7 U	1.6 U
AROCLOR-1016		37 U	42 U	81 U	79 U
AROCLOR-1221		75 U	86 U	170 U	160 U
AROCLOR-1232		75 U	86 U	170 U	160 U
AROCLOR-1242		37 U	42 U	81 U	79 U
AROCLOR-1248		37 U	42 U	81 U	79 U
AROCLOR-1254		18 U	21 U	40 U	38 U
AROCLOR-1260		18 U	21 U	40 U	38 U
BETA-BHC		1.5 U	1.7 U	3.2 U	3.1 U
CHLORDANE		7.5 U	8.6 U	17 U	16 U
DELTA-BHC		0.75 U	0.86 U	1.7 U	1.6 U
DIELDRIN		0.75 U	0.86 U	1.7 U	1.6 U
ENDOSULFAN I		0.75 U	0.86 U	1.7 U	1.6 U
ENDOSULFAN II		1.5 U	1.7 U	3.2 U	3.1 U
ENDOSULFAN SULFATE		1.5 U	1.7 U	3.2 U	3.1 U
ENDRIN		1.5 U	1.7 U	200	3.1 U
ENDRIN ALDEHYDE		1.5 U	1.7 U	3.2 U	3.1 U
ENDRIN KETONE		1.5 U	1.7 U	3.2 U	3.1 U
GAMMA-BHC (LINDANE)		0.75 U	0.86 U	1.7 U	1.6 U
HEPTACHLOR		0.75 U	0.86 U	1.7 U	1.6 U
HEPTACHLOR EPOXIDE		0.75 U	0.86 U	1.7 U	1.6 U
KEPONE		45 UJ	51 UJ	49 UJ	48 UJ
METHOXYCHLOR		3 U	3.5 U	6.7 U	6.4 U
TOXAPHENE		37 U	42 U	81 U	79 U
Inorganics (mg/kg)					
ANTIMONY		1.1 U	1.3 U	1.2 U	1.2 U
ARSENIC		0.38 J	0.26 J	0.2 J	0.31 J
BARIUM		4.2 J	2.7 J	2.9 J	3 J
BERYLLIUM		0.09 J	0.08 U	0.07 U	0.07 U
CADMIUM		0.27 U	0.31 U	0.3 U	0.28 U
CHROMIUM		1.4 UJ	0.63 UJ	3.1	4.1
COBALT		0.69 U	0.8 U	0.76 U	0.74 U
COPPER		1.2 UJ	0.79 UJ	1.4 UJ	1.6 UJ
CYANIDE		0.09 J	1.8	1.2	0.13 J
LEAD		2.1	3.3	6.2	6.6
MERCURY		0.03 U	0.04 U	0.03 J	0.03 U
NICKEL		1.3 U	1.5 U	1.4 U	1.4 U
SELENIUM		0.11 U	0.13 U	0.12 U	0.12 U
SILVER		0.31 U	0.36 U	0.35 U	0.33 U
THALLIUM		0.13 U	0.15 U	0.15 U	0.14 U
TIN		3 U	4 J	5.3 J	3.2 U
VANADIUM		4.4 J	1.1 J	2.9 J	3.2 J
ZINC		4.7	9.5	4.7 J	5
Miscellaneous Parameters (mg/kg)					
TOTAL ORGANIC CARBON	691				

TABLE A3-3
SWMU No. 17, Groundwater - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-MW01S	MPT-17-MW01S	MPT-17-MW02S	MPT-17-MW03S
Sample ID	17G00101	17G00101D	17G00201	17G00301
Sample Date	06/18/95	06/18/95	06/18/95	06/18/95
Volatile Organics (ug/L)				
1,1,1,2-TETRACHLOROETHANE	5 U	5 U	5 U	5 U
1,1,1-TRICHLOROETHANE	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5 U	5 U	5 U	5 U
1,2,3-TRICHLOROPROPANE	5 U	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	10 UJ	10 UJ	10 UJ	10 UJ
1,2-DICHLOROBENZENE	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	5 U	5 U	5 U	5 U
1,2-DICHLOROETHENE (TOTAL)	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5 U	5 U	5 U	5 U
1,4-DICHLOROBENZENE	5 U	5 U	5 U	5 U
1,4-DIOXANE	200 R	200 R	200 R	200 R
2-BUTANONE	10 R	10 R	10 R	10 R
2-CHLOROETHYL VINYL ETHER	10 UJ	10 UJ	10 UJ	10 UJ
2-HEXANONE	10 U	10 U	10 U	10 U
3-CHLOROPROPENE	5 U	5 U	5 U	5 U
4-CHLORO-3-METHYLPHENOL	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10 U	10 U	10 U	10 U
ACETONE	10 U	18 U	10 U	10 U
ACETONITRILE	100 UJ	100 UJ	100 UJ	100 UJ
ACROLEIN	100 U	100 U	100 U	100 U
ACRYLONITRILE	100 U	100 U	100 U	100 U
BENZENE	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE	5 U	5 U	5 U	5 U
BROMOFORM	5 U	5 U	5 U	5 U
BROMOMETHANE	10 U	10 U	10 U	10 U
CARBON DISULFIDE	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5 U	5 U	5 U	5 U
CHLOROBENZENE	5 U	5 U	5 U	5 U
CHLOROETHANE	10 U	10 U	10 U	10 U
CHLOROFORM	5 U	5 U	5 U	5 U
CHLOROMETHANE	10 U	10 U	10 U	10 U
CHLOROPRENE	200 U	200 U	200 U	200 U
CIS-1,3-DICHLOROPROPENE	5 U	5 U	5 U	5 U
DIBROMOCHLOROMETHANE	5 U	5 U	5 U	5 U
DIBROMOMETHANE	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	10 U	10 U	10 U	10 U
ETHYL METHACRYLATE	5 U	5 U	5 U	5 U
ETHYLBENZENE	5 U	5 U	5 U	5 U
ETHYLENE DIBROMIDE	5 U	5 U	5 U	5 U
IODOMETHANE	10 U	10 U	10 U	10 U
ISOBUTYL ALCOHOL	200 R	200 R	200 R	200 R
METHACRYLONITRILE	5 U	5 U	5 U	5 U
METHYL METHACRYLATE	10 U	10 U	10 U	10 U
METHYLENE CHLORIDE	5 U	5 U	5 U	5 U
PENTACHLOROETHANE	10 U	10 U	10 U	10 U
PROPIONITRILE	100 UJ	100 UJ	100 UJ	100 UJ
STYRENE	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5 U	5 U	5 U	5 U
TOLUENE	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5 U	5 U	5 U	5 U
TRANS-1,4-DICHLORO-2-BUTENE	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5 U	5 U	5 U	5 U
TRICHLOROFLUOROMETHANE	5 U	5 U	5 U	5 U
VINYL ACETATE	10 U	10 U	10 U	10 U
VINYL CHLORIDE	10 U	10 U	10 U	10 U
XYLENES, TOTAL	5 U	5 U	5 U	5 U
Semivolatile Organics (ug/L)				
1,2,4,5-TETRACHLOROBENZENE	50 U	50 U	50 U	50 U
1,2,4-TRICHLOROBENZENE	10 U	10 U	10 U	10 U
1,2-DIPHENYLHYDRAZINE	10 U	10 U	10 U	10 U
1,3,5-TRINITROBENZENE	10 U	10 U	10 U	10 U
1,3-DINITROBENZENE	10 U	10 U	10 U	10 U
1,4-NAPHTHOQUINONE	1000 R	1000 R	1000 R	1000 R
1-NAPHTHYLAMINE	50 UJ	50 UJ	50 UJ	50 UJ
2,3,4,6-TETRACHLOROPHENOL	10 U	10 U	10 U	10 U
2,4,5-TRICHLOROPHENOL	50 U	50 U	50 U	50 U
2,4,6-TRICHLOROPHENOL	10 U	10 U	10 U	10 U
2,4-DICHLOROPHENOL	10 U	10 U	10 U	10 U
2,4-DIMETHYLPHENOL	10 U	10 U	10 U	10 U
2,4-DINITROPHENOL	50 U	50 U	50 U	50 U
2,4-DINITROTOLUENE	10 U	10 U	10 U	10 U
2,6-DICHLOROPHENOL	10 U	10 U	10 U	10 U
2,6-DINITROTOLUENE	10 U	10 U	10 U	10 U
2-ACETYLAMINOFLUORENE	10 UJ	10 UJ	10 UJ	10 UJ
2-CHLORONAPHTHALENE	10 U	10 U	10 U	10 U
2-CHLOROPHENOL	10 U	10 U	10 U	10 U
2-METHYLNAPHTHALENE	10 U	10 U	10 U	10 U
2-METHYLPHENOL	10 U	10 U	10 U	10 U
2-NAPHTHYLAMINE	50 U	50 U	50 U	50 U

TABLE A3-3
SWMU No. 17, Groundwater - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-MW01S	MPT-17-MW01S	MPT-17-MW02S	MPT-17-MW03S
Sample ID	17G00101	17G00101D	17G00201	17G00301
Sample Date	06/18/95	06/18/95	06/18/95	06/18/95
2-NITROANILINE	50 U	50 U	50 U	50 U
2-NITROPHENOL	10 U	10 U	10 U	10 U
2-PICOLINE	50 U	50 U	50 U	50 U
3&4-METHYLPHENOL	10 U	10 U	10 U	10 U
3,3'-DICHLOROBENZIDINE	20 U	20 U	20 U	20 U
3,3'-DIMETHYLBENZIDINE	10 UJ	10 UJ	10 UJ	10 UJ
3-METHYLCHOLANTHRENE	10 U	10 U	10 U	10 U
3-NITROANILINE	50 U	50 U	50 U	50 U
4,6-DINITRO-2-METHYLPHENOL	50 U	50 U	50 U	50 U
4-AMINOBIPHENYL	50 U	50 U	50 U	50 U
4-BROMOPHENYL PHENYL ETHER	10 U	10 U	10 U	10 U
4-CHLOROANILINE	10 U	10 U	10 U	10 U
4-CHLOROPHENYL PHENYL ETHER	10 U	10 U	10 U	10 U
4-NITROANILINE	50 U	50 U	50 U	50 U
4-NITROPHENOL	50 U	50 U	50 U	50 U
4-NITROQUINOLINE-1-OXIDE	500 UJ	500 UJ	500 UJ	500 UJ
5-NITRO-O-TOLUIDINE	10 U	10 U	10 U	10 U
7,12-DIMETHYLBENZ(A)ANTHRACENE	10 U	10 U	10 U	10 U
ACENAPHTHENE	10 U	10 U	10 U	10 U
ACENAPHTHYLENE	10 U	10 U	10 U	10 U
ACETOPHENONE	10 U	10 U	10 U	10 U
ANILINE	10 U	10 U	10 U	10 U
ANTHRACENE	10 U	10 U	10 U	10 U
ARAMITE	50 U	50 U	50 U	50 U
BENZIDINE	50 U	50 U	50 U	50 U
BENZO(A)ANTHRACENE	10 U	10 U	10 U	10 U
BENZO(A)PYRENE	10 U	10 U	10 U	10 U
BENZO(B)FLUORANTHENE	10 U	10 U	10 U	10 U
BENZO(G,H,I)PERYLENE	10 U	10 U	10 U	10 U
BENZO(K)FLUORANTHENE	10 U	10 U	10 U	10 U
BENZOIC ACID	50 U	50 U	50 U	50 U
BENZYL ALCOHOL	10 U	10 U	10 U	10 U
BIS(2-CHLOROETHOXY)METHANE	10 U	10 U	10 U	10 U
BIS(2-CHLOROETHYL)ETHER	10 U	10 U	10 U	10 U
BIS(2-CHLOROISOPROPYL) ETHER	10 U	10 U	10 U	10 U
BIS(2-ETHYLHEXYL)PHTHALATE	3 J	10 U	10 U	8 J
BUTYLBENZYL PHTHALATE	10 U	10 U	10 U	10 U
CHLOROBENZILATE	0.5 U	0.5 U	0.5 U	0.5 U
CHRYSENE	10 U	10 U	10 U	10 U
DI-N-BUTYL PHTHALATE	10 U	10 U	10 U	10 U
DI-N-OCTYL PHTHALATE	10 U	10 U	10 U	10 U
DIALLATE	1 U	1 U	1 U	1 U
DIBENZO(A,H)ANTHRACENE	10 U	10 U	10 U	10 U
DIBENZOFURAN	10 U	10 U	10 U	10 U
DIETHYL PHTHALATE	10 U	10 U	10 U	10 U
DIMETHYL PHTHALATE	10 U	10 U	10 U	10 U
ETHYL METHANESULFONATE	10 U	10 U	10 U	10 U
FLUORANTHENE	10 U	10 U	10 U	10 U
FLUORENE	10 U	10 U	10 U	10 U
HEXACHLOROBENZENE	10 U	10 U	10 U	10 U
HEXACHLOROBUTADIENE	10 U	10 U	10 U	10 U
HEXACHLOROCYCLOPENTADIENE	10 U	10 U	10 U	10 U
HEXACHLOROETHANE	10 U	10 U	10 U	10 U
HEXACHLOROPHENE	500 UJ	500 UJ	500 UJ	500 UJ
HEXACHLOROPROPENE	50 UJ	50 UJ	50 UJ	50 UJ
INDENO(1,2,3-CD)PYRENE	10 U	10 U	10 U	10 U
ISODRIN	0.02 U	0.02 U	0.02 U	0.02 U
ISOPHORONE	10 U	10 U	10 U	10 U
ISOSAFROLE	50 U	50 U	50 U	50 U
METHAPYRILENE	50 UJ	50 UJ	50 UJ	50 UJ
METHYL METHANESULFONATE	10 UJ	10 UJ	10 UJ	10 UJ
N-NITROSO-DI-N-PROPYLAMINE	10 U	10 U	10 U	10 U
N-NITROSODI-N-BUTYLAMINE	10 U	10 U	10 U	10 U
N-NITROSODIETHYLAMINE	10 U	10 U	10 U	10 U
N-NITROSODIMETHYLAMINE	10 U	10 U	10 U	10 U
N-NITROSODIPHENYLAMINE	10 U	10 U	10 U	10 U
N-NITROSOMETHYLETHYLAMINE	10 U	10 U	10 U	10 U
N-NITROSOMORPHOLINE	10 U	10 U	10 U	10 U
N-NITROSOPIPERIDINE	10 U	10 U	10 U	10 U
N-NITROSOPYRROLIDINE	10 U	10 U	10 U	10 U
NAPHTHALENE	10 U	10 U	10 U	10 U
NITROBENZENE	10 U	10 U	10 U	10 U
O-TOLUIDINE	10 U	10 U	10 U	10 U
P-DIMETHYLAMINOAZOBENZENE	10 U	10 U	10 U	10 U
P-PHENYLENEDIAMINE	500 UJ	500 UJ	500 UJ	500 UJ
PENTACHLOROBENZENE	50 U	50 U	50 U	50 U
PENTACHLORONITROBENZENE	50 U	50 U	50 U	50 U
PENTACHLOROPHENOL	50 U	50 U	50 U	50 U
PHENACETIN	10 U	10 U	10 U	10 U
PHENANTHRENE	10 U	10 U	10 U	10 U
PHENOL	10 U	10 U	10 U	10 U
PHENYL-TERT-BUTYLAMINE	50 UJ	50 UJ	50 UJ	50 UJ
PRONAMIDE	10 U	10 U	10 U	10 U
PYRENE	10 U	10 U	10 U	10 U
PYRIDINE	50 U	50 U	50 U	50 U

TABLE A3-3
SWMU No. 17, Groundwater - CMS Data Set
NAVSTA Mayport - Mayport, Florida

Sample Location	MPT-17-MW01S	MPT-17-MW01S	MPT-17-MW02S	MPT-17-MW03S
Sample ID	17G00101	17G00101D	17G00201	17G00301
Sample Date	06/18/95	06/18/95	06/18/95	06/18/95
SAFROLE	50 U	50 U	50 U	50 U
Pesticides/PCBs (ug/L)				
4,4'-DDD	0.04 U	0.04 U	0.04 U	0.04 U
4,4'-DDE	0.02 U	0.02 U	0.02 U	0.02 U
4,4'-DDT	0.04 U	0.04 U	0.04 U	0.04 U
ALDRIN	0.02 U	0.02 U	0.02 U	0.02 U
ALPHA-BHC	0.02 U	0.02 U	0.02 U	0.02 U
AROCLOR-1016	1 U	1 U	1 U	1 U
AROCLOR-1221	2 U	2 U	2 U	2 U
AROCLOR-1232	2 U	2 U	2 U	2 U
AROCLOR-1242	1 U	1 U	1 U	1 U
AROCLOR-1248	1 U	1 U	1 U	1 U
AROCLOR-1254	0.5 U	0.5 U	0.5 U	0.5 U
AROCLOR-1260	0.5 U	0.5 U	0.5 U	0.5 U
BETA-BHC	0.04 U	0.04 U	0.04 U	0.04 U
CHLORDANE	0.2 U	0.2 U	0.2 U	0.2 U
DELTA-BHC	0.02 U	0.02 U	0.02 U	0.02 U
DIELDRIN	0.02 U	0.02 U	0.02 U	0.02 U
ENDOSULFAN I	0.02 U	0.02 U	0.02 U	0.02 U
ENDOSULFAN II	0.04 U	0.04 U	0.04 U	0.04 U
ENDOSULFAN SULFATE	0.04 U	0.04 U	0.04 U	0.04 U
ENDRIN	0.04 U	0.04 U	0.04 U	0.04 U
ENDRIN ALDEHYDE	0.04 U	0.04 U	0.04 U	0.04 U
ENDRIN KETONE	0.04 U	0.04 U	0.04 U	0.04 U
GAMMA-BHC (LINDANE)	0.02 U	0.02 U	0.02 U	0.02 U
HEPTACHLOR	0.02 U	0.02 U	0.02 U	0.02 U
HEPTACHLOR EPOXIDE	0.02 U	0.02 U	0.02 U	0.02 U
KEPONE	1 U	1 U	1 U	1 U
METHOXYCHLOR	0.08 U	0.08 U	0.08 U	0.08 U
TOXAPHENE	1 U	1 U	1 U	1 U
Inorganics (ug/L)				
ANTIMONY	5 U	5 U	5 U	5 UJ
ARSENIC	3.3 J	3.1 J	2.1 J	0.7 J
BARIUM	16.8 J	16.9 J	21.9 J	10.6 J
BERYLLIUM	0.3 U	0.3 U	0.3 U	0.3 U
CADMIUM	1.2 U	1.2 U	1.2 U	1.2 U
CALCIUM	162000	163000	126000	155000
CHROMIUM	1.7 U	1.7 U	1.7 U	1.7 U
COBALT	3.1 U	3.1 U	3.1 U	3.9 J
COPPER	1 U	1 U	1 U	1.3 J
CYANIDE	1.5 U	1.6 UJ	1.5 U	1.5 U
IRON	988	1110	2220	229
LEAD	0.4 U	0.8 UJ	0.4 U	0.4 U
MAGNESIUM	10700	10700	6010	9250
MANGANESE	294	295	221	172
MERCURY	0.1 U	0.1 U	0.1 U	0.1 U
NICKEL	6.1 UJ	6.1 UJ	6.1 UJ	6.1 UJ
SELENIUM	0.5 U	0.5 U	0.5 U	0.5 UJ
SILVER	1.4 U	1.4 U	1.4 U	1.4 U
SODIUM	21900	22000	19100	25400
THALLIUM	0.6 U	0.6 U	0.6 U	0.6 U
TIN	13.6 U	13.6 U	13.6 U	13.6 U
VANADIUM	4.5 J	5.2 J	2.6 J	8.2 J
ZINC	5.2 UJ	5.6 UJ	5.7 UJ	7.2 UJ
Miscellaneous Parameters (mg/L)				
ALKALINITY AS CACO3	389		348	453
AMMONIA, AS NITROGEN	0.4		1.5	11.5
CHLORIDE	34.9		25.2	28.8
HARDNESS AS CaCO3	462		371	421
SULFATE	75.1		6.5	25.5
SULFIDE	1 U		1 U	4
TOTAL DISSOLVED SOLIDS	581		415	571
TOTAL KJELDAHL NITROGEN	0.7		1.9	12
TOTAL ORGANIC CARBON	11.8		10.8	41.8
TOTAL PHOSPHORUS	1.04		0.34	1.5
Petroleum Hydrocarbons (mg/L)				
OIL & GREASE	5 U		5 U	5 U
TOTAL PETROLEUM HYDROCARBONS			0.05 U	

APPENDIX B

REPRESENTATIVE CONCENTRATIONS

SWMU 17

CARBONACEOUS FUEL BOILER AREA

REPRESENTATIVE CONCENTRATION ESTIMATION FOR SOIL CHEMICALS OF CONCERN

results	p203	p437	p454	p518
PARAMETER	ARSENIC	BENZO(A)PYRENE	DIBENZO(A,H)ANTHRACENE	DIELDRIN
UNITS	MG/KG	UG/KG	UG/KG	UG/KG
SAMPLE - DETECTS - MAX	1.8000	**270.0000**	**140.0000**	**11.0000**
SAMPLE - COUNT	15.0000	15.0000	15.0000	15.0000
SAMPLE - AVERAGE	0.7133	409.2667	473.6667	5.3953
SAMPLE - W NORMAL	0.9179	0.7961	0.7405	0.6930
SAMPLE - W LOGNORMAL	0.8799	0.8573	0.8161	0.7772
SAMPLE - W TEST	0.8810	0.8810	0.8810	0.8810
SAMPLE UCL - NORMAL	**0.8969**	530.0163	595.5345	8.7344
SAMPLE UCL - LOGNORMAL	1.1880	701.8281	663.2877	41.0434
SAMPLE - NUMBER OF DETECTS	14.0000	3.0000	1.0000	1.0000

Dataset: SSOIL17_RES
Media : Surface Soil
Group : SWMU 17

Parameter : ~~DIBENZOFURAN~~ (UG/KG)

DiBenz(A,H)ANTHRACENE

	CLP Results	Screening Results
Count	15.0000	No samples
Number of Detects	1.0000	
Average	473.6667	
Detection Limit - Minimum	170.0000	
Detection Limits - Maximum	900.0000	
Positive Hits - Minimum	140.0000	
Positive Hits - Maximum	140.0000	
Average Of Positive Hits	140.0000	
Standard Deviation	268.0250	
Upper Confidence Limit - Normal	595.5345	
Upper Confidence Limit - Lognormal ...	663.2877	
95th Percentile - Nonparametric.......		
95th Percentile - Normal.............	914.5677	
95th Percentile - Lognormal	1036.4696	
Upper Tolerance Limit - Normal		
Upper Tolerance Limit - Lognormal		

Shapiro-Wilk and Probabilty Plot Results:

Corr Coeff - Detected - Normal	**************	
Corr Coeff - Detected - Lognormal	**************	
Corr Coeff - Total - Normal	0.8668	
Corr Coeff - Total - Lognormal	0.9041	
Corr Coeff - Crit Val - Detected	0.8790	
Corr Coeff - Crit Val - Total	0.9370	
W-Test - Table Value	0.8810	NA
W-Test - Normal	0.7405	NA
W-Test - Lognormal	0.8161	NA

Type of Distribution .... Undefined

Test Results:

Dataset: SSOIL17_RES
Media : Surface Soil
Group : SWMU 17

Parameter : ARSENIC (MG/KG)

	CLP Results	Screening Results
Count	15.0000	No samples
Number of Detects	14.0000	
Average	0.7133	
Detection Limit - Minimum	0.0800	
Detection Limits - Maximum	0.0800	
Positive Hits - Minimum	0.3300	
Positive Hits - Maximum	1.8000	
Average Of Positive Hits	0.7586	
Standard Deviation	0.4038	
Upper Confidence Limit - Normal	0.8969	
Upper Confidence Limit - Lognormal ...	1.1880	
95th Percentile - Nonparametric.......		
95th Percentile - Normal.............	1.3775	
95th Percentile - Lognormal	1.9118	
Upper Tolerance Limit - Normal		
Upper Tolerance Limit - Lognormal		

Shapiro-Wilk and Probabilty Plot Results:

Corr Coeff - Detected - Normal	0.8961	
Corr Coeff - Detected - Lognormal	0.9629	
Corr Coeff - Total - Normal	0.9462	
Corr Coeff - Total - Lognormal	0.9227	
Corr Coeff - Crit Val - Detected	0.9340	
Corr Coeff - Crit Val - Total	0.9370	
W-Test - Table Value	0.8810	NA
W-Test - Normal	0.9179	NA
W-Test - Lognormal	0.8799	NA

Type of Distribution .... NORMAL

Test Results:

Dataset: SSOIL17_RES
Media : Surface Soil
Group : SWMU 17

Parameter : BENZO(A)PYRENE (UG/KG)

	CLP Results	Screening Results
Count	15.0000	No samples
Number of Detects	3.0000	
Average	409.2667	
Detection Limit - Minimum	170.0000	
Detection Limits - Maximum	900.0000	
Positive Hits - Minimum	54.0000	
Positive Hits - Maximum	270.0000	
Average Of Positive Hits	144.6667	
Standard Deviation	265.5658	
Upper Confidence Limit - Normal	530.0163	
Upper Confidence Limit - Lognormal ...	701.8281	
95th Percentile - Nonparametric.......		
95th Percentile - Normal.............	846.1225	
95th Percentile - Lognormal	1130.2362	
Upper Tolerance Limit - Normal		
Upper Tolerance Limit - Lognormal		

Shapiro-Wilk and Probabilty Plot Results:

Corr Coeff - Detected - Normal	0.9635	
Corr Coeff - Detected - Lognormal	0.9978	
Corr Coeff - Total - Normal	0.8939	
Corr Coeff - Total - Lognormal	0.9200	
Corr Coeff - Crit Val - Detected	0.8790	
Corr Coeff - Crit Val - Total	0.9370	
W-Test - Table Value	0.8810	NA
W-Test - Normal	0.7961	NA
W-Test - Lognormal	0.8573	NA

Type of Distribution .... Undefined

Test Results:

Dataset: SSOIL17_RES
Media : Surface Soil
Group : SWMU 17

Parameter : DIELDRIN (UG/KG)

	CLP Results	Screening Results
Count	15.0000	No samples
Number of Detects	1.0000	
Average	5.3953	
Detection Limit - Minimum	0.3450	
Detection Limits - Maximum	18.5000	
Positive Hits - Minimum	11.0000	
Positive Hits - Maximum	11.0000	
Average Of Positive Hits	11.0000	
Standard Deviation	7.3436	
Upper Confidence Limit - Normal	8.7344	
Upper Confidence Limit - Lognormal	41.0434	
95th Percentile - Nonparametric		
95th Percentile - Normal	17.4755	
95th Percentile - Lognormal	26.0550	
Upper Tolerance Limit - Normal		
Upper Tolerance Limit - Lognormal		

Shapiro-Wilk and Probabilty Plot Results:

Corr Coeff - Detected - Normal	**************	
Corr Coeff - Detected - Lognormal	**************	
Corr Coeff - Total - Normal	0.8439	
Corr Coeff - Total - Lognormal	0.8993	
Corr Coeff - Crit Val - Detected	0.8790	
Corr Coeff - Crit Val - Total	0.9370	
W-Test - Table Value	0.8810	NA
W-Test - Normal	0.6930	NA
W-Test - Lognormal	0.7772	NA

Type of Distribution .... Undefined

Test Results:

APPENDIX B-2

RESIDENTIAL CHEMICALS OF CONCERN ANALYSIS

SWMU 12 SURFACE SOIL

SWMU 12 SURFACE SOIL INITIAL COPCs - RESIDENTIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR[2]	INITIAL TARGET CRITERIA[3] (mg/kg)	EXCEEDS INITIAL TARGET CRITERIA[4]
Inorganics								
Arsenic	7440-38-2	3/3	1.3	0.8	Carcinogen -Cardiovascular -Skin	4	0.2	Yes
Barium	7440-39-3	3/3	8	110	Cardiovascular	3	36.67	No
Beryllium	7440-41-7	3/3	0.08	120	Carcinogen -Gastrointestinal -Respiratory	4	30	No
Cadmium	7440-43-9	2/3	1.2	75	Carcinogen -Kidney	4	18.75	No
Chromium[5]	7440-47-3	3/3	3.4	210	Carcinogen -Respiratory	4	52.5	No
Cobalt	7440-48-4	1/3	0.65	4700	Cardiovascular -Immunological -Neurological-Reproductive	4	1,175	No
Copper	7440-50-8	3/3	3.8	110	None Specified	1	110	No
Cyanide	57-12-5	2/3	0.17	30	Body Weight -Neurological -Thyroid	4	7.5	No
Lead	7439-92-1	3/3	14	400	Neurological	4	100	No
Mercury	7439-97-6	1/3	0.05	3.4	Neurological	4	0.85	No
Nickel	7440-02-0	1/3	2.6	110	Body Weight	2	55	No
Vanadium	7440-62-2	3/3	10.3	15	None Specified	1	15	No
Zinc	7440-66-6	3/3	23.3	23000	Blood	1	23,000	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.
2 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ.
3 - The SCTL for direct exposure to soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative affects.
4 - Comparison of the Initial Target Criteria with the Maximum Concentration.
5 - SCTL Residential screening values used for Chromium (Hexavalent)

SWMU 12 SURFACE SOIL FINAL COPCs - RESIDENTIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

INITIAL COPC	CAS NUMBER	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[2]			ADJUSTMENT DIVISOR[3]	DIRECT EXPOSURE TARGET CRITERIA[4] (mg/kg)	COPC BASED ON RESIDENTIAL DIRECT EXPOSURE[5] (Yes/No)
					Carcinogen	Cardiovascular	Skin			
Arsenic	7440-38-2	1.3	0.8	Carcinogen -Cardiovascular -Skin	1.63	1.63	1.63	1	0.8	Yes
Cumulative Sum	1.63	1.63	1.63							

Notes:

1 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.

2 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.

3 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ. If the Cumulative Sum is less than 1 then the Adjustment Divisor is equal to 1.

4 - The SCTL for direct exposure with soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative affects.

5 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the COPC target criteria.

SWMU 12 SURFACE SOIL RESIDENTIAL COPCs - LEACHING
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL LEACHING TO GROUNDWATER[1] (mg/kg)	SCTL LEACHING TO SURFACEWATER[2] (mg/kg)	LEACHING TARGET CRITERIA[3] (mg/kg)	COPC BASED ON LEACHING[4] (Yes/No)
Inorganics							
Arsenic	7440-38-2	3/3	1.3	29	NA	29	No
Barium	7440-39-3	3/3	8	1,600	NA	1,600	No
Beryllium	7440-41-7	3/3	0.08	63	NA	63	No
Cadmium	7440-43-9	2/3	1.2	8	NA	8	No
Chromium[5]	7440-47-3	3/3	3.4	38	NA	38	No
Cobalt	7440-48-4	1/3	0.65	No Criteria	NA	No Criteria	No
Copper	7440-50-8	3/3	3.8	No Criteria	NA	No Criteria	No
Cyanide	57-12-5	2/3	0.17	40	NA	40	No
Lead	7439-92-1	3/3	14	No Criteria	NA	No Criteria	No
Mercury	7439-97-6	1/3	0.05	2.1	NA	2.1	No
Nickel	7440-02-0	1/3	2.6	130	NA	130	No
Vanadium	7440-62-2	3/3	10.3	980	NA	980	No
Zinc	7440-66-6	3/3	23.3	6,000	NA	6,000	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Soil leaching to groundwater - Chapter 62-777 F.A.C., May 1999
2 - SCTL - Soil Cleanup Target Level for Soil leaching to surface water - Chapter 62-777 F.A.C., May 1999
3 - Minimum SCTL based to soil leaching to groundwater and soil leaching to surface water (if applicable) .
4 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the leaching target criteria.
5 - SCTL screening values used for Chromium (Hexavalent)
NA - Not Applicable

SWMU 12 SURFACE SOIL COCs - RESIDENTIAL DIRECT EXPOSURE AND LEACHING (COMBINED)
NAVSTA MAYPORT, FLORIDA

COCs	CAS NUMBER	MAXIMUM CONCENTRATION (mg/kg)	REPRESENTATIVE CONCENTRATION[1] (mg/kg)	BACKGROUND CONCENTRATION[2] (mg/kg)	SITE-SPECIFIC SCTL - RESIDENTIAL DIRECT EXPOSURE[3] (mg/kg)	SITE-SPECIFIC SCTL - LEACHING TO GROUNDWATER[4] (mg/kg)	MEDIA CLEANUP STANDARD[5] (mg/kg)	MEDIA CLEANUP STANDARD BASIS[6]
Arsenic	7440-38-2	1.3	1.3	-	0.8	-	0.8	Direct Exposure

Notes:

1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - Mayport background concentration (Tetra Tech NUS, 2000).
3 - The Site Specific SCTL - Direct Exposure is the Residential SCTL divided by the Adjustment Divisor or the background concentration, whichever is greater.
4 - The Site Specific SCTL - Leaching to Groundwater is the Leaching to Groundwater SCTL or the background concentration, whichever is greater.
5 - Media Cleanup Standard is the Minimum of the Site Specific SCTL - Direct Exposure or Site Specific SCTL - Leaching to Groundwater.
6 - Media Cleanup Standard Basis is either Background, Direct Exposure or Leaching (Leaching to Groundwater or Leaching to Surface Water (if applicable)).

SWMU 17 SURFACE SOIL

SWMU 17 SURFACE SOIL INITIAL COPCs - RESIDENTIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR[2]	INITIAL TARGET CRITERIA[3] (mg/kg)	EXCEEDS INITIAL TARGET CRITERIA[4]
2-Butanone	78-93-3	OV	2/15	0.011	3,100	Developmental	2	1,550	No
Carbon Disulfide	75-15-0	OV	3/15	0.003	200	Developmental - Neurological	10	20	No
Toluene	108-88-3	OV	4/15	0.004	380	Kidney -Liver -Neurological	10	38	No
Xylenes, Total	1330-20-7	OV	11/15	0.01	5,900	Body Weight -Mortality - Neurological	10	590	No
Benzo(a)anthracene	56-55-3	OS	2/15	0.17	1.4	Carcinogen	18	0.078	Yes
Benzo(a)pyrene	50-32-8	OS	3/15	0.27	0.1	Carcinogen	18	0.0056	Yes
Benzo(b)fluoranthene	205-99-2	OS	3/15	0.28	1.4	Carcinogen	18	0.078	Yes
Benzo(g,h,i)perylene	191-24-2	OS	3/15	0.36	2,300	Neurological	10	230	No
Benzo(k)fluoranthene	207-08-9	OS	3/15	0.37	15	Carcinogen	18	0.83	No
Bis(2-Ethylhexyl)phthalate	117-81-7	OS	3/15	0.14	76	Carcinogen -Liver	18	4.22	No
Chrysene	218-01-9	OS	3/15	0.29	140	Carcinogen	18	7.78	No
Di-n-butyl phthalate	84-74-2	OS	3/15	0.044	7,300	Mortality	3	2,433	No
Dibenzo(a,h)anthracene	53-70-3	OS	1/15	0.14	0.1	Carcinogen	18	0.006	Yes
Fluoranthene	206-44-0	OS	5/15	0.36	2,900	Blood -Kidney -Liver	8	362.5	No
Indeno(1,2,3-cd)pyrene	193-39-5	OS	3/15	0.28	1.5	Carcinogen	18	0.083	Yes
Naphthalene	91-20-3	OS	1/15	0.21	40	Body Weight -Nasal	5	8	No
Phenanthrene	85-01-8	OS	2/15	0.095	2,000	Kidney	6	333.33	No
Pyrene	129-00-0	OS	5/15	0.28	2,200	Kidney	6	366.67	No
4,4'-DDD	72-54-8	PES	3/15	0.012	4.6	Carcinogen	18	0.26	No
4,4'-DDE	72-55-9	PES	13/15	0.52	3.3	Carcinogen	18	0.18	Yes
4,4'-DDT	50-29-3	PES	11/15	0.22	3.3	Carcinogen -Liver	18	0.18	Yes
Aroclor-1260	11096-82-5	PES	1/15	0.031	0.5	Carcinogen -Immunological	18	0.028	Yes
Chlordane	57-74-9	PES	7/15	0.18	3.1	Carcinogen -Liver	18	0.17	Yes
Dieldrin	60-57-1	PES	1/15	0.011	0.07	Carcinogen -Liver	18	0.0039	Yes
Endrin	72-20-8	PES	1/15	0.0035	21	Liver	8	2.63	No
Aluminum	7429-90-5	M	10/10	2,900	72,000	Body Weight	5	14,400	No
Antimony	7440-36-0	M	8/15	2.5	26	Blood -Mortality	4	6.5	No
Arsenic	7440-38-2	M	14/15	1.8	0.8	Carcinogen -Cardiovascular - Skin	18	0.044	Yes

SWMU 17 SURFACE SOIL INITIAL COPCs - RESIDENTIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR[2]	INITIAL TARGET CRITERIA[3] (mg/kg)	EXCEEDS INITIAL TARGET CRITERIA[4]
Barium	7440-39-3	M	15/15	25.4	110	Cardiovascular	3	36.67	No
Beryllium	7440-41-7	M	10/15	0.17	120	Carcinogen -Gastrointestinal -Respiratory	18	6.67	No
Cadmium	7440-43-9	M	4/15	1.2	75	Carcinogen -Kidney	18	4.17	No
Calcium	7440-70-2	M	10/10	273,000				Nutrient	No
Chromium[5]	7440-47-3	M	15/15	20.2	210	Carcinogen -Respiratory	18	11.67	Yes
Cobalt	7440-48-4	M	6/15	1.6	4,700	Cardiovascular -Immunological -Neurological-Reproductive	10	470	No
Copper	7440-50-8	M	12/15	18.4	110	None Specified	1	110	No
Cyanide	57-12-5	M	3/15	0.25	30	Body Weight -Neurological -Thyroid	10	3	No
Iron	7439-89-6	M	10/10	3,320	23,000	Blood -Gastrointestinal	4	5,750	No
Lead	7439-92-1	M	15/15	252	400	Neurological	10	40	Yes
Magnesium	7439-95-4	M	10/10	1,850				Nutrient	No
Manganese	7439-96-5	M	10/10	78.6	1,600	Neurological	10	160	No
Mercury	7439-97-6	M	7/15	0.14	3.4	Neurological	10	0.34	No
Nickel	7440-02-0	M	1/15	10.4	110	Body Weight	5	22	No
Selenium	7782-49-2	M	4/15	0.44	390	Hair Loss -Neurological -Skin	10	39	No
Sodium	7440-23-5	M	10/10	715				Nutrient	No
Tin	7440-31-5	M	9/15	69	44,000	Kidney -Liver	8	5,500	No
Vanadium	7440-62-2	M	15/15	13.5	15	None Specified	1	15	No
Zinc	7440-66-6	M	15/15	91.2	23,000	Blood	4	5,750	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.
2 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ.
3 - The SCTL for direct exposure with soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative affects.
4 - Comparison of the Initial Target Criteria with the Maximum Concentration.
5 - SCTL Residential screening values used for Chromium (Hexavalent)
M - Metals
OS - Semivolatiles
OV - Volatiles
PES - Pesticides
PET - Petroleum
Misc - Miscellaneous

SWMU 17 SURFACE SOIL FINAL COPCs - RESIDENTIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL [1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[2]							ADJUSTMENT DIVISOR[3]	DIRECT EXPOSURE TARGET CRITERIA[4] (mg/kg)	COPC BASED ON RESIDENTIAL DIRECT EXPOSURE[5] (Yes/No)
						Carcinogen	Cardiovascular	Skin	Respiratory	Neurological	Liver	Immunological			
Benzo(a)anthracene	56-55-3	OS	0.17	1.4	Carcinogen	0.121							12	0.117	Yes
Benzo(a)pyrene	50-32-8	OS	0.27	0.1	Carcinogen	2.7							12	0.0083	Yes
Benzo(b)fluoranthene	205-99-2	OS	0.28	1.4	Carcinogen	0.2							12	0.117	Yes
Dibenzo(a,h)anthracene	53-70-3	OS	0.14	0.1	Carcinogen	1.4							12	0.008	Yes
Indeno(1,2,3-cd)pyrene	193-39-5	OS	0.28	1.5	Carcinogen	0.187							12	0.125	Yes
4,4'-DDE	72-55-9	PES	0.52	3.3	Carcinogen	0.158							12	0.28	Yes
4,4'-DDT	50-29-3	PES	0.22	3.3	Carcinogen -Liver	0.067					0.067		12	0.28	No
Aroclor-1260	11096-82-5	PES	0.031	0.5	Carcinogen - Immunological	0.062						0.062	12	0.042	No
Chlordane	57-74-9	PES	0.18	3.1	Carcinogen -Liver	0.058					0.058		12	0.26	No
Dieldrin	60-57-1	PES	0.011	0.07	Carcinogen -Liver	0.157					0.157		12	0.0058	Yes
Arsenic	7440-38-2	M	1.8	0.8	Carcinogen - Cardiovascular -Skin	2.25	2.25	2.25					12	0.067	Yes
Chromium[4]	7440-47-3	M	20.2	210	Carcinogen -Respiratory	0.096			0.096				12	17.50	Yes
Lead	7439-92-1	M	252	400	Neurological					0.63			1	400	No
					Cumulative Sum	7.456	2.25	2.25	0.096	0.63	0.282	0.062			

Notes:

1 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.

2 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.

3 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ. If the Cumulative Sum is less than 1 then the Adjustment Divisor is equal to 1.

4 - The SCTL for direct exposure with soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative affects.

5 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the COPC target criteria.

SWMU 17 SURFACE SOIL COPCs - LEACHING
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL LEACHING TO GROUNDWATER[1] (mg/kg)	SCTL LEACHING TO SURFACEWATER[2] (mg/kg)	LEACHING TARGET CRITERIA[3] (mg/kg)	COPC BASED ON LEACHING[4] (Yes/No)
2-Butanone	78-93-3	OV	2/15	0.011	17	NA	17	No
Carbon Disulfide	75-15-0	OV	3/15	0.003	5.6	NA	5.6	No
Toluene	108-88-3	OV	4/15	0.004	0.5	NA	0.5	No
Xylenes, Total	1330-20-7	OV	11/15	0.01	0.2	NA	0.2	No
Benzo(a)anthracene	56-55-3	OS	2/15	0.17	3.2	NA	3.2	No
Benzo(a)pyrene	50-32-8	OS	3/15	0.27	8	NA	8	No
Benzo(b)fluoranthene	205-99-2	OS	3/15	0.28	10	NA	10	No
Benzo(g,h,i)perylene	191-24-2	OS	3/15	0.36	32,000	NA	32,000	No
Benzo(k)fluoranthene	207-08-9	OS	3/15	0.37	25	NA	25	No
Bis(2-Ethylhexyl)phthalate	117-81-7	OS	3/15	0.14	3,600	NA	3,600	No
Chrysene	218-01-9	OS	3/15	0.29	77	NA	77	No
Di-n-butyl phthalate	84-74-2	OS	3/15	0.044	47	NA	47	No
Dibenzo(a,h)anthracene	53-70-3	OS	1/15	0.14	30	NA	30	No
Fluoranthene	206-44-0	OS	5/15	0.36	1,200	NA	1,200	No
Indeno(1,2,3-cd)pyrene	193-39-5	OS	3/15	0.28	28	NA	28	No
Naphthalene	91-20-3	OS	1/15	0.21	1.7	NA	1.7	No
Phenanthrene	85-01-8	OS	2/15	0.095	250	NA	250	No
Pyrene	129-00-0	OS	5/15	0.28	880	NA	880	No
4,4'-DDD	72-54-8	PES	3/15	0.012	4	NA	4	No
4,4'-DDE	72-55-9	PES	13/15	0.52	18	NA	18	No
4,4'-DDT	50-29-3	PES	11/15	0.22	11	NA	11	No
Aroclor-1260	11096-82-5	PES	1/15	0.031	17	NA	17	No
Chlordane	57-74-9	PES	7/15	0.18	9.6	NA	9.6	No
Dieldrin	60-57-1	PES	1/15	0.011	0.004	NA	0.004	Yes
Endrin	72-20-8	PES	1/15	0.0035	1	NA	1	No

SWMU 17 SURFACE SOIL COPCs - LEACHING
NAVSTA MAYPORT, FLORIDA
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CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL LEACHING TO GROUNDWATER[1] (mg/kg)	SCTL LEACHING TO SURFACEWATER[2] (mg/kg)	LEACHING TARGET CRITERIA[3] (mg/kg)	COPC BASED ON LEACHING[4] (Yes/No)
Aluminum	7429-90-5	M	10/10	2,900	No Criteria	NA	No Criteria	No
Antimony	7440-36-0	M	8/15	2.5	5	NA	5	No
Arsenic	7440-38-2	M	14/15	1.8	29	NA	29	No
Barium	7440-39-3	M	15/15	25.4	1600	NA	1,600	No
Beryllium	7440-41-7	M	10/15	0.17	63	NA	63	No
Cadmium	7440-43-9	M	4/15	1.2	8	NA	8	No
Calcium	7440-70-2	M	10/10	273,000	No Criteria	NA	No Criteria	No
Chromium[4]	7440-47-3	M	15/15	20.2	38	NA	38	No
Cobalt	7440-48-4	M	6/15	1.6	No Criteria	NA	No Criteria	No
Copper	7440-50-8	M	12/15	18.4	No Criteria	NA	No Criteria	No
Cyanide	57-12-5	M	3/15	0.25	40	NA	40	No
Iron	7439-89-6	M	10/10	3,320	No Criteria	NA	No Criteria	No
Lead	7439-92-1	M	15/15	252	No Criteria	NA	No Criteria	No
Magnesium	7439-95-4	M	10/10	1,850	No Criteria	NA	No Criteria	No
Manganese	7439-96-5	M	10/10	78.6	No Criteria	NA	No Criteria	No
Mercury	7439-97-6	M	7/15	0.14	2.1	NA	2.1	No
Nickel	7440-02-0	M	1/15	10.4	130	NA	130	No
Selenium	7782-49-2	M	4/15	0.44	5	NA	5	No
Sodium	7440-23-5	M	10/10	715	No Criteria	NA	No Criteria	No
Tin	7440-31-5	M	9/15	69	No Criteria	NA	No Criteria	No
Vanadium	7440-62-2	M	15/15	13.5	980	NA	980	No
Zinc	7440-66-6	M	15/15	91.2	6,000	NA	6,000	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Soil leaching to groundwater - Chapter 62-777 F.A.C., May 1999
2 - SCTL - Soil Cleanup Target Level for Soil leaching to surfacewater - Chapter 62-777 F.A.C., May 1999
3 - Minimum SCTL based to soil leaching to groundwater and soil leaching to surface water (if applicable) .
4 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the leaching target criteria.
5 - SCTL screening values used for Chromium (Hexavalent)
NA - Not Applicable

SWMU 17 SURFACE SOIL COCs - RESIDENTIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

COPCs	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	REPRESENTATIVE CONCENTRATION[1] (mg/kg)	SCTL RESIDENTIAL[2] (mg/kg)	BACKGROUND CONCENTRATION[3] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[4]					ADJUSTMENT DIVISOR[5]	MEDIA CLEANUP STANDARD - DIRECT EXPOSURE[6] (mg/kg)	COC BASED ON RESIDENTIAL DIRECT EXPOSURE[7]
								Carcinogen	Cardiovascular	Skin	Respiratory	Liver			
Benzo(a)anthracene	56-55-3	2/15	0.17	0.17	1.4	-	Carcinogen	0.121					9	0.156	Yes
Benzo(a)pyrene	50-32-8	3/15	0.27	0.27	0.1	-	Carcinogen	2.7					9	0.011	Yes
Benzo(b)fluoranthene	205-99-2	3/15	0.28	0.28	1.4	-	Carcinogen	0.2					9	0.156	Yes
Dibenzo(a,h)anthracene	53-70-3	1/15	0.14	0.14	0.1	-	Carcinogen	1.4					9	0.011	Yes
Indeno(1,2,3-cd)pyrene	193-39-5	3/15	0.28	0.28	1.5	-	Carcinogen	0.187					9	0.167	Yes
4,4'-DDE	72-55-9	13/15	0.52	0.52	3.3	-	Carcinogen	0.158					9	0.37	Yes
Dieldrin	60-57-1	1/15	0.011	0.011	0.07	-	Carcinogen -Liver	0.157				0.157	9	0.0078	Yes
Arsenic	7440-38-2	14/15	1.8	1.8	0.8	-	Carcinogen - Cardiovascular - Skin	2.25	2.25	2.25			9	0.089	Yes
Chromium[4]	7440-47-3	15/15	20.2	20.2	210	-	Carcinogen - Respiratory	0.096			0.096		9	23.33	No
							Cumulative Sum	7.269	2.25	2.25	0.096	0.157			

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.
3 - Mayport background concentration (Tetra Tech NUS, 2000).
4 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
5 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ. If the Cumulative Sum is less than 1 then the Adjustment Divisor is equal to 1.
6 - The Media Cleanup Standard (MCS) Direct Exposure is the Residential SCTL divided by Adjustment Divisor or the background concentration, whichever is greater.
7 - A COPC is selected as a COC if the representative concentration exceeds the Adjusted Media Cleanup Standard Direct Contact.

SWMU 17 SURFACE SOIL COCs - LEACHING
NAVSTA MAYPORT, FLORIDA

COPCs	CAS NUMBER	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	REPRESENTATIVE CONCENTRATION[1] (mg/kg)	SCTL LEACHING TO GROUNDWATER[2] (mg/kg)	SCTL LEACHING TO SURFACEWATER[3] (mg/kg)	BACKGROUND CONCENTRATION[4] (mg/kg)	MEDIA CLEANUP STANDARD - LEACHING[5] (mg/kg)	COC BASED ON LEACHING[6]
Dieldrin	60-57-1	1/15	0.011	0.011	0.004	NA	-	0.004	Yes

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - SCTL - Soil Cleanup Target Level for Leaching to Groundwater - Chapter 62-777 F.A.C., May 1999
3 - SCTL - Soil Cleanup Target Level for Soil leaching to surface water - Chapter 62-777 F.A.C., May 1999
4 - Mayport background concentration (Tetra Tech NUS, 2000).
5 - The Media Cleanup Standard (MCS) Leaching is the Leaching to Groundwater SCTL or the background concentration, whichever is greater.
6 - A COPC is selected as a COC if the representative concentration exceeds the Media Cleanup Standard - Leaching.
NA - Not Applicable

SWMU 17 SURFACE SOIL COCs - RESIDENTIAL DIRECT EXPOSURE AND LEACHING (COMBINED)
NAVSTA MAYPORT, FLORIDA

COCs	CAS NUMBER	MAXIMUM CONCENTRATION (mg/kg)	REPRESENTATIVE CONCENTRATION[1] (mg/kg)	BACKGROUND CONCENTRATION[2] (mg/kg)	SITE-SPECIFIC SCTL - RESIDENTIAL DIRECT EXPOSURE[3] (mg/kg)	SITE-SPECIFIC SCTL - LEACHING TO GROUNDWATER[4] (mg/kg)	MEDIA CLEANUP STANDARD[5] (mg/kg)	MEDIA CLEANUP STANDARD BASIS[6]
Benzo(a)anthracene	56-55-3	0.17	0.17	-	0.156	-	0.156	Direct Contact
Benzo(a)pyrene	50-32-8	0.27	0.27	-	0.011	-	0.011	Direct Contact
Benzo(b)fluoranthene	205-99-2	0.28	0.28	-	0.156	-	0.156	Direct Contact
Dibenzo(a,h)anthracene	53-70-3	0.14	0.14	-	0.011	-	0.011	Direct Contact
Indeno(1,2,3-cd)pyrene	193-39-5	0.28	0.28	-	0.167	-	0.167	Direct Contact
4,4'-DDE	72-55-9	0.52	0.52	-	0.37	-	0.37	Direct Contact
Dieldrin	60-57-1	0.011	0.011	-	0.0078	0.004	0.004	Leaching
Arsenic	7440-38-2	1.8	1.8	-	0.089	-	0.089	Direct Contact

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - Mayport background concentration (Tetra Tech NUS, 2000).
3 - The Site Specific SCTL - Direct Exposure is the Residential SCTL divided by the Adjustment Divisor or the background concentration, whichever is greater.
4 - The Site Specific SCTL - Leaching to Groundwater is the Leaching to Groundwater SCTL or the background concentration, whichever is greater.
5 - Media Cleanup Standard is the Minimum of the Site Specific SCTL - Direct Exposure or Site Specific SCTL - Leaching to Groundwater.
6 - Media Cleanup Standard Basis is either Background, Direct Exposure or Leaching (Leaching to Groundwater or Leaching to Surface Water (if applicable)).

SWMU 17 SUBSURFACE SOIL

SWMU 17 - SUBSURFACE SOIL INITIAL COPCs - RESIDENTIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY OF DETECTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR[2]	INITIAL TARGET CRITERIA[3] (mg/kg)	EXCEEDS INITIAL TARGET CRITERIA[4]
2-Butanone	78-93-3	OV	1/3	0.006	3,100	Developmental	2	1,550	No
Carbon Disulfide	75-15-0	OV	1/3	0.003	200	Developmental -Neurological	6	33.33	No
Toluene	108-88-3	OV	1/3	0.002	380	Kidney -Liver -Neurological	6	63.33	No
Xylenes, Total	1330-20-7	OV	3/3	0.003	5,900	Body Weight -Mortality -Neurological	6	983.33	No
2-Methylnaphthalene	91-57-6	OV	1/3	0.17	83	Body Weight -Nasal	3	27.67	No
4,4'-DDD	72-54-8	PES	2/3	0.065	4.6	Carcinogen	6	0.77	No
4,4'-DDE	72-55-9	PES	2/3	0.18	3.3	Carcinogen	6	0.55	No
4,4'-DDT	50-29-3	PES	1/3	0.0041	3.3	Carcinogen -Liver	6	0.55	No
Endrin	72-20-8	PES	1/3	0.2	21	Liver	4	5.25	No
Arsenic	7440-38-2	M	3/3	0.38	0.8	Carcinogen -Cardiovascular -Skin	6	0.13	Yes
Barium	7440-39-3	M	3/3	4.2	110	Cardiovascular	2	55	No
Beryllium	7440-41-7	M	1/3	0.09	120	Carcinogen -Gastrointestinal -Respiratory	6	20	No
Chromium[5]	7440-47-3	M	1/3	4.1	210	Carcinogen -Respiratory	6	35	No
Cyanide	57-12-5	M	3/3	1.8	30	Body Weight -Neurological -Thyroid	6	5	No
Lead	7439-92-1	M	3/3	6.6	400	Neurological	6	66.67	No
Mercury	7439-97-6	M	1/3	0.03	3.4	Neurological	6	0.57	No
Tin	7440-31-5	M	2/3	5.3	44,000	Kidney -Liver	4	11,000	No
Vanadium	7440-62-2	M	3/3	4.4	15	None Specified	1	15	No
Zinc	7440-66-6	M	3/3	9.5	23,000	Blood	1	23,000	No
Total Organic Carbon	7440-44-0	MISC	1/1	691	No Criteria			No Criteria	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.
2 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ.
3 - The SCTL for direct exposure with soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative affects.
4 - Comparison of the Initial Target Criteria with the Maximum Concentration.
5 - SCTL Residential screening values used for Chromium (Hexavalent)
M - Metals
OS - Semivolatiles
OV - Volatiles
PES - Pesticides
PET - Petroleum
Misc - Miscellaneous

SWMU 17 SUBSURFACE SOIL FINAL COPCs - RESIDENTIAL DIRECT EXPOSURE
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[2]			ADJUSTMENT DIVISOR[3]	DIRECT EXPOSURE TARGET CRITERIA[4] (mg/kg)	COPC BASED ON RESIDENTIAL DIRECT EXPOSURE[5] (Yes/No)
						Carcinogen	Cardiovascular	Skin			
Arsenic	7440-38-2	M	0.38	0.8	Carcinogen - Cardiovascular - Skin	0.48	0.48	0.48	1	0.8	No
					Cumulative Sum	0.48	0.48	0.48			

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.
2 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
3 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ. If the Cumulative Sum is less than 1 then the Adjustment Divisor is equal to 1.
4 - The SCTL for direct exposure with soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative affects.
5 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the COPC target criteria.

APPENDIX C

AREAS AND VOLUMES OF CONTAMINATED MEDIA

SWMU 12

NEUTRALIZATION BASIN

CALCULATION OF AQUIFER PLUME DEPTH
SWMU 12
MAYPORT NAVAL STATION, FLORIDA

Equation to Estimate Mixing Depth in an Aquifer: SWMU N0. 12

H = B[1-exp(-Vz X L/(BVx))] + (2av X L)^1/2 (Salhotra, et al., 1990)

Where:
H = mixing depth
B = aquifer saturated thickness
Vx = horizontal seepage velocity
Vz = vertical seepage velocity
L = length of source area
av = vertical dispersivity = (0.05)(0.1)(Lp)
Lp = Length of plume

Given:	B =	60	ft	based on RFI depth to top of Hawthorn sediments and depth to water table at SWMU No. 12
	Vx =	0.215	ft/day	using average Group II SWMU's horizontal seepage velocity
	Vz =	0.0033	ft/day	assuming 1/10 ratio for Kz/Kx (see comments below)
	L =	10	ft	estimated for hypothetical contaminated soil area from sodium hydroxide spill and infiltration
	av =	0.8	ft	(see formula above)
	Lp =	160	ft	based on distance from sodium hydroxide spill area to St. Johns River
Then:	H =	4.2	ft	

Comments:

Using vertical and horizontal gw flow rates provided in the GIR/RFI for Group II SWMUs, approximately 18 of the surfical aquifer thickness is estimated to be contaminated. However, the GIR description of sediments and the depositional environment at NAVSTA Mayport suggest the deposits are at least moderately stratified. Therefore, a vertical to horizontal conductivity ratio of 1/10 was assumed (see Walton 1987, Appendix C). Then, using the average horizontal conductivity for wells in the Group II SWMU area, the 1994 vertical gradient (SWMU 8), and the GIR estimate for effective porosity of 0.35, a vertical seepage velocity was calculated for use in the above equation (see below).

Vz = (0.01)(6 f/d)(0.019 f/f) / 0.35 = 0.0033 f/d

References:

Salhorta, A.M., P. Mineants, S. Sharp-Hansen, and T. Allison, 1990. "Multimedia Exposure Assessment Model (Multimed) for the Evaluating the Land Disposal of Wastes - Model Theory", EPA Contract No. 68-03-3513 and No. 68-03-6304, U.S. EPA, Athens, GA.

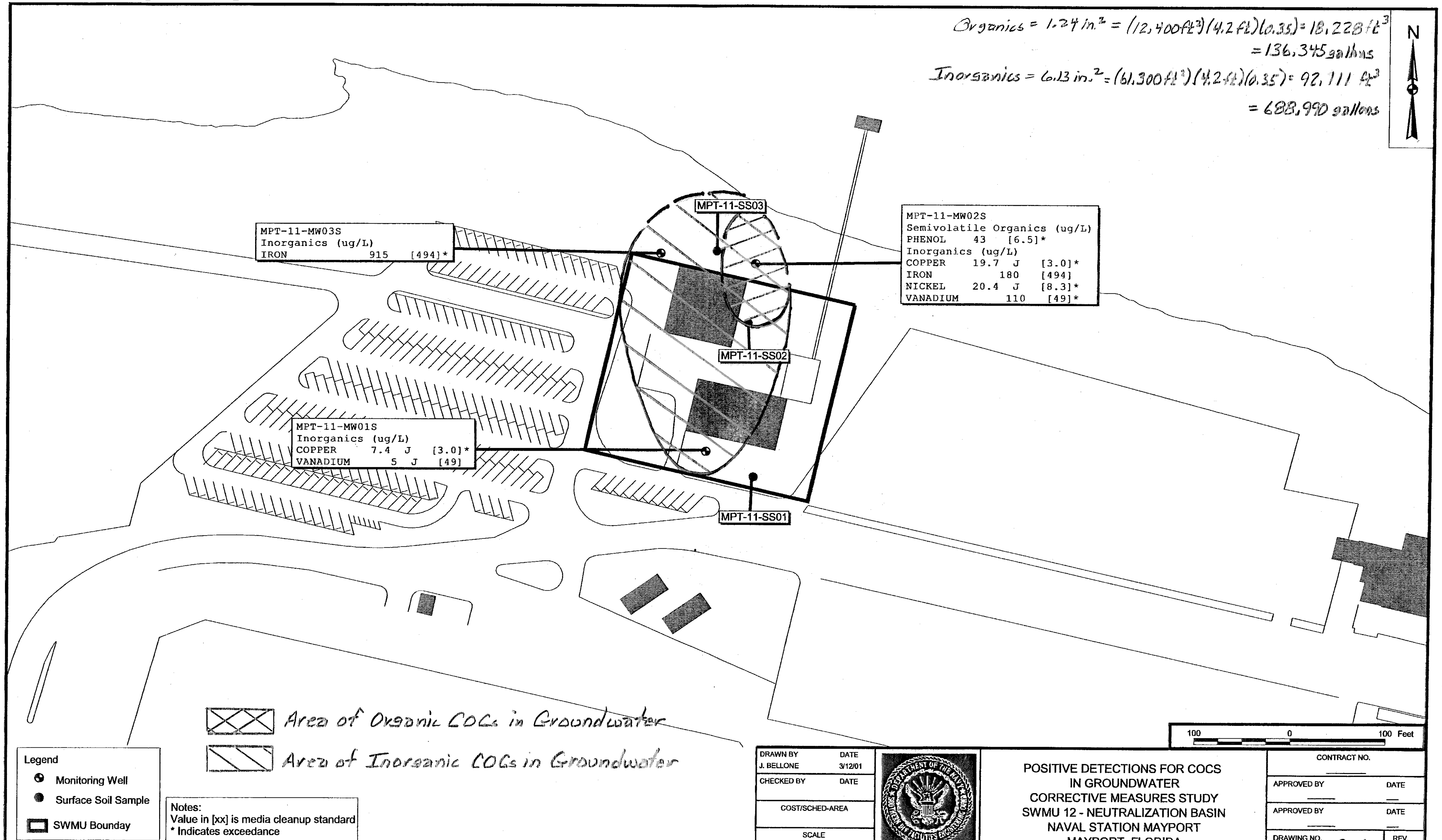
Walton, W. C., 1987. Groundwter Pumping Tests - Design and Analysis, Lewis Publishers, Chelsea, MI.

P:\GIS\MAYPORT\SWMU12-17_CMS3.APR\FIG 2-3_POSITIVE DETECTIONS FOR COCS IN GROUNDWATER, SWMU 12 JCB 3/13/01

Volume of GW = (Area)(Mixing Depth)(porosity)

Organics = 1.24 in.^{2} = (12,400 ft^2)(4.2 ft)(0.35) = 18,228 ft^3 = 136,345 gallons

Inorganics = 6.13 in.^{2} = (61,300 ft^2)(4.2 ft)(0.35) = 92,111 ft^3 = 688,990 gallons



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J. BELLONE	3/12/01
CHECKED BY	DATE
COST/SCHED-AREA	
SCALE AS NOTED	

POSITIVE DETECTIONS FOR COCS
IN GROUNDWATER
CORRECTIVE MEASURES STUDY
SWMU 12 - NEUTRALIZATION BASIN
NAVAL STATION MAYPORT
MAYPORT, FLORIDA

CONTRACT NO.	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. C-1	REV. 0

SWMU 17

CARBONACEOUS FUEL BOILER AREA

CALCULATION OF AQUIFER PLUME DEPTH
SWMU 17
MAYPORT NAVAL STATION, FLORIDA

Equation to Estimate Mixing Depth in an Aquifer: SWMU N0. 17

H = B[1-exp(-Vz X L/(BVx))] + (2av X L)^1/2 (Salhotra, et al., 1990)

Where:
H = mixing depth
B = aquifer saturated thickness
Vx = horizontal seepage velocity
Vz = vertical seepage velocity
L = length of source area
av = vertical dispersivity = (0.05)(0.1)(Lp)
Lp = Length of plume

Given:	B =	65	ft	based on RFI depth to top of Hawthorn sediments and depth to water table at SWMU No. 17
	Vx =	0.036	ft/day	horizontal flow velocity calculated for SWMU No. 17 using RFI data
	Vz =	0.004831	ft/day	assuming 1/10 ratio for Kz/Kx (see comments below)
	L =	200	ft	unknown; based on distance between contaminated wells parallel to groundwater flow direction
	av =	0.975	ft	(see formula above)
	Lp =	195	ft	assuming release occurred at the midpoint of the operating period (i.e., 1986), and using average horizontal groundwater flow velocity of 13 ft/yr with no retardation
Then:	H =	41.7	ft	

Comments:

Using vertical and horizontal gw flow rates provided in the GIR/RFI for Group III SWMUs, the entire thickness of the surfical aquifer thickness is estimated to be contaminated. However, the GIR description of sediments and the depositional environment at NAVSTA Mayport suggest the deposits are at least moderately stratified. Therefore, a vertical to horizontal conductivity ratio of 1/10 was assumed (see Walton 1987, Appendix C). Then, using the average horizontal conductivity for wells at SWMU No. 17, the 1994 vertical gradient (SWMU 8), and the GIR estimate for effective porosity of 0.35, a vertical seepage velocity was calculated for use in the above equation (see below).

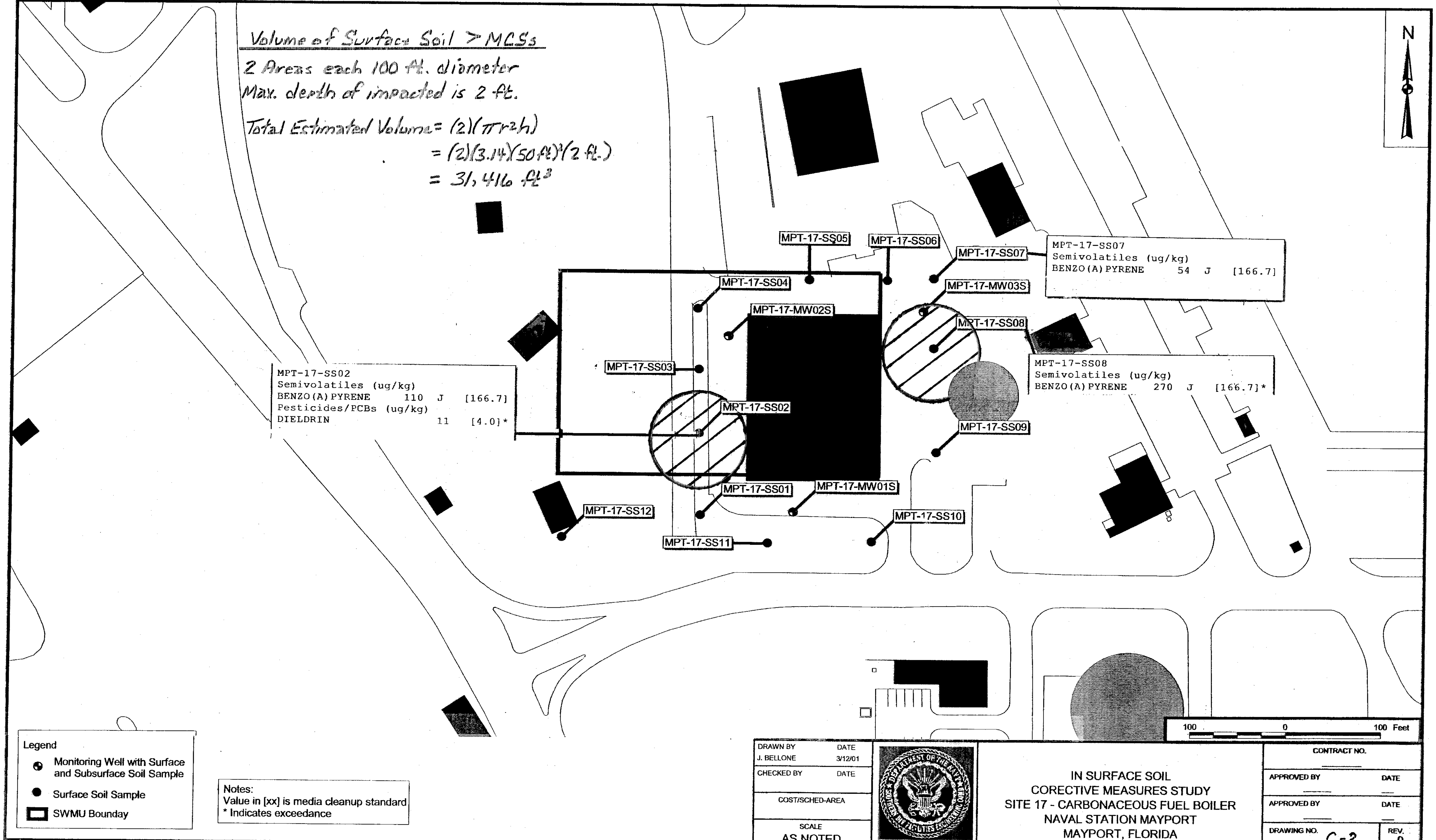
Vz = (0.01)(8.9 f/d)(0.019 f/f) / 0.35 = 0.004831 f/d

References:

Salhorta, A.M., P. Mineants, S. Sharp-Hansen, and T. Allison, 1990. "Multimedia Exposure Assessment Model (Multimed) for the Evaluating the Land Disposal of Wastes - Model Theory", EPA Contract No. 68-03-3513 and No. 68-03-6304, U.S. EPA, Athens, GA.

Walton, W. C., 1987. Groundwter Pumping Tests - Design and Analysis, Lewis Publishers, Chelsea, MI.

P:\GIS\MAYPORT\SWMU12-17_CMS3.APR\FIG 3-2_SAMPLE LOCATION MAP, SWMU 17 JCB 2/12/01



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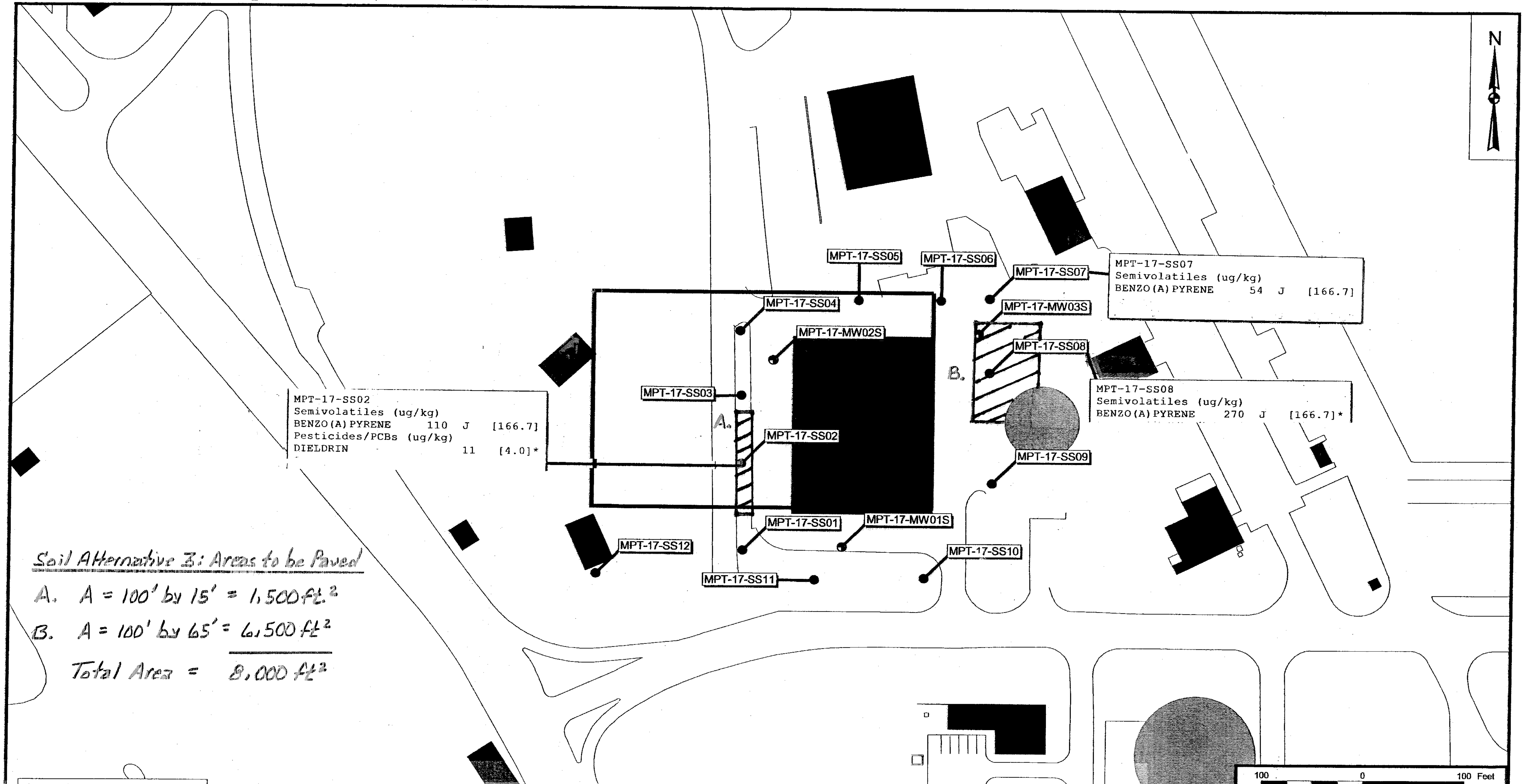
COST/SCHED-AREA	
SCALE	AS NOTED

IN SURFACE SOIL
CORECTIVE MEASURES STUDY
SITE 17 - CARBONACEOUS FUEL BOILER
NAVAL STATION MAYPORT
MAYPORT, FLORIDA

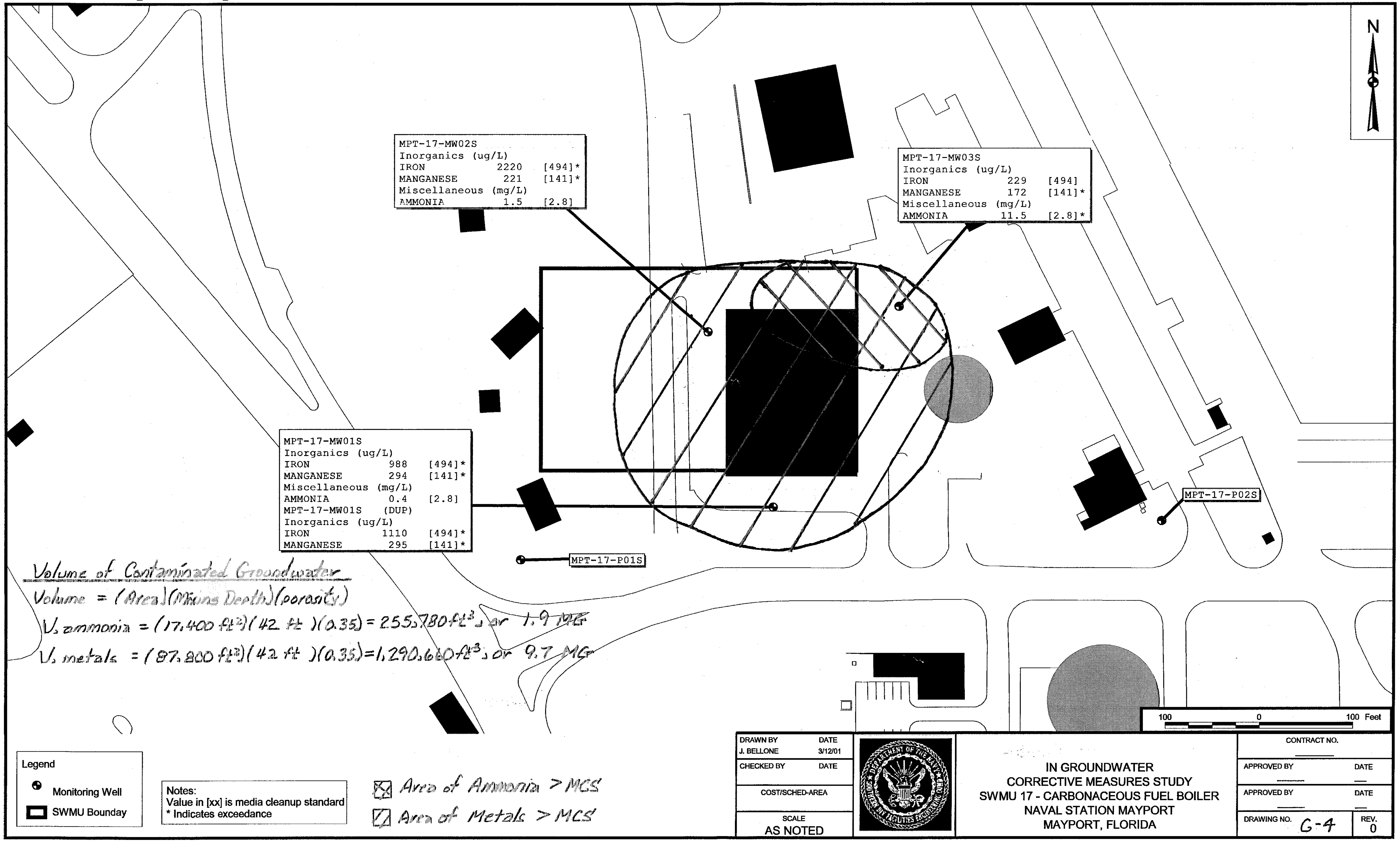
CONTRACT NO.	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. C-2	REV. 0

P:\GIS\MAYPORT\SWMU12-17_CMS3.APR\FIG 3-2_SAMPLE LOCATION MAP, SWMU 17 JCB 2/12/01



DRAWN BY J. BELLONE	DATE 3/12/01	POSITIVE DETECTIONS FOR COCS IN SURFACE SOIL CORECTIVE MEASURES STUDY SITE 17 - CARBONACEOUS FUEL BOILER NAVAL STATION MAYPORT MAYPORT, FLORIDA	CONTRACT NO.
CHECKED BY	DATE		APPROVED BY — DATE —
COST/SCHED-AREA			APPROVED BY — DATE —
SCALE AS NOTED			DRAWING NO. C-3 REV. 0

P:\GIS\MAYPORT\SWMU12-17_CMS3.APR\FIG 3-4_POSITIVE DETECTIONS FOR COCS IN GROUNDWATER, SWMU 17 JCB 3/13/01



APPENDIX D

COST ESTIMATES FOR CORRECTIVE MEASURES ALTERNATIVES

SWMU 12

NEUTRALIZATION BASIN

APPENDIX D1

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 12
SOIL ALTERNATIVE 1: NO ACTION
CAPITAL COSTS

TABLE D1-1

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Remedial Action Plan		hr			$33.79		$0	$0	$0	$0	$0
2 MOBILIZATION/DEMOBILIZATION											
2 Equipment Mob/Demob (Exc. & Dozier)		ea			$200.00	$250.00	$0	$0	$0	$0	$0
2 Mobilize/Demobilize Personnel (2-persons)		ea		$375.00	$300.00		$0	$0	$0	$0	$0
2.3 Portable Toilet		mo	$74.18				$0	$0	$0	$0	$0
2.4 Storage Trailer (28' x 10')		mo	$98.33				$0	$0	$0	$0	$0
3 DECONTAMINATION											
3.1 Temporary Decon Pad		ls		$450.00	$400.00	$155.00	$0	$0	$0	$0	$0
3.2 Decon Water Disposal		drum	$125.00				$0	$0	$0	$0	$0
3.3 Decon Water Storage Drums		ea		$45.00			$0	$0	$0	$0	$0
3.4 PPE (2 p * 5 days * 2 Weeks)		m-day		$30.00			$0	$0	$0	$0	$0
3.5 Decontaminate Equipment (Pressure Washer)		ea			$134.45	$50.00	$0	$0	$0	$0	$0
4 SITE PREPARATION											
4.1 Erosion Control Fencing		lf		$0.23	$1.17		$0	$0	$0	$0	$0
4.2 Collect/Analyze Delineation Samples (inorganics)		ea	$305.00	$10.00	$23.52		$0	$0	$0	$0	$0
4.3 Construction Surveys (2-man crew)		day	$648.36				$0	$0	$0	$0	$0
4.4 Utility Location and Site Delineation/Layout		hrs			$33.23		$0	$0	$0	$0	$0
5 EXCAVATION/BACKFILL											
5.1 Excavate/Load Contaminated Soil (1.0 cy Hyd. Excavator		cy			$1.27	$2.23	$0	$0	$0	$0	$0
5.2 Standby, Crawler Mounted 1.0 CY Hydraulic Excavator		hrs				$20.50	$0	$0	$0	$0	$0
5.3 Health & Safety Monitoring with OVA during Excavation		day			$188.16	$100.00	$0	$0	$0	$0	$0
5.4 Collect/Analyze Confirmatory Samples		ea	$305.00	$10.00	$23.52		$0	$0	$0	$0	$0
5.5 Import (Offsite) Place, Compact Clean Fill Material		cy		$7.82	$0.85	$1.81	$0	$0	$0	$0	$0
6 OFF-SITE TRANSPORTATION/DISPOSAL											
6.1 Waste Profile		ls	$750.00				$0	$0	$0	$0	$0
6.2 Transport and Dispose of Soil (Non-hazardous) in Landfi		ton	$45.00				$0	$0	$0	$0	$0
6.3 Prepare Shipment Manifests		hrs			$33.23		$0	$0	$0	$0	$0
7 SITE RESTORATION											
7.1 Import Vegetative Cover Material (Topsoil)		cy		$15.00			$0	$0	$0	$0	$0
7.2 Place/Grade Topsoil (6")		day			$227.20	$435.00	$0	$0	$0	$0	$0
7.3 Sod Disturbed Area		acre	##########				$0	$0	$0	$0	$0
8 LAND USE CONTROLS											
8.1 Site Survey (2-man crew)		days	$648.36				$0	$0	$0	$0	$0
8.2 Prepare Land Use Plan		hours			$33.79		$0	$0	$0	$0	$0
8.3 Modify Master Plan and Prepare Deed Restrictions		hours			$33.79		$0	$0	$0	$0	$0
Subtotal Direct Capital Costs less Subcontract								$0	$0	$0	$0
Local Area Adjustment								84%	84%	84%	
								$0	$0	$0	$0
Overhead on Labor Cost @ 30%									$0		$0
G & A on Labor Cost @ 10%									$0		$0
G & A on Material Cost @ 10%								$0			$0
Total Direct Capital Cost								$0	$0	$0	$0

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 12
SOIL ALTERNATIVE 1: NO ACTION
CAPITAL COSTS

TABLE D1-1

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
Indirects on Total Direct Labor Cost @ 75%									$0		$0
Profit on Total Direct Cost @ 10%											$0
Subtotal											$0
Health & Safety Monitoring @ 3%		(Includes Subcontractor cost)									$0
Total Field Cost											**$0**
Subtotal Subcontractor Cost							$0				$0
G & A on Subcontract Cost @ 10%							$0				$0
Profit on Subcontractor Cost @ 5%											$0
Subcontractor Cost											**$0**
tingency on Total Field and Subcontractor Costs @ 10%											**$0**
ineering on Total Field and Subcontractor Costs @ 5%											**$0**
TOTAL Capital COST											**$0**

TABLE D1-2

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 12
SOIL ALTERNATIVE 1: NO ACTION
Operation and Maintenance Costs per Year

	Item	Qty	Unit	Unit Cost	Subtotal Cost	Notes
1	Energy - Electric		kWh	$0.06	$0	
2	Maintenance		ls		$0	5% of Installation Cost
3	Carbon Unit Changeout/Regeneration of Spent Carbon		pound	$3.00	$0	once a year
4	Labor, Mobilization/Demobilization, Per Diem, Supplies		wk	$925.00	$0	1 visit per week - 1 day
5	Labor, Mobilization/Demobilization, Per Diem, Supplies		mo	$1,950.00	$0	1 visit per quarter - 2 laborers, 2 days
6	Analysis of Off-gas samples		ea	$250.00	$0	1 per month, VOCs
7	Quarterly Reports		ea	$4,000.00	$0	
	Total Cost for One Year Operation				$0	

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 12
SOIL ALTERNATIVE 1: NO ACTION
ANNUAL COSTS

TABLE D1-3

Cost Item	Quantity	Unit	Unit Cost	Labor Overhead[a]	Total Cost
1 FIVE YEAR SITE REVIEWS (FOR 30 YEAR PERIOD)					
1.1 Site Review Meeting (2-persons for 2-days)					
Project Manager	16	hr	$38.00	$38.00	$1,216
Staff Engineer	16	hr	$26.02	$26.02	$833
ODCs (travel, etc.)	1	ls	$800.00		$800
1.2 Five Year Review Report					
Project Manager	16	hr	$38.00	$38.00	$1,216
Staff Engineer	32	hr	$26.02	$26.02	$1,665
ODCs (photocopies, telephone, etc.)	1	ls	$100.00		$100
Subtotal Five Year Review Cost					$5,830
G&A and Profit @ 15%					$874
Subtotal					$6,704
Contingency @ 10%					$670.44
Total Five Year Review Cost					**$7,375**

[a] Overhead on professional labor @ 100%.

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 12

TABLE D1-4

SOIL ALTERNATIVE 1: NO ACTION
PRESENT WORTH ANALYSIS

Year	Capital Cost	Operation and Maintenance Cost	Annual Cost	Total Yearly Cost	Present-Worth Factor (i = 6%)	Present Worth
0	$0			$0	1.000	$0
1		$0	$0	$0	0.943	$0
2		$0	$0	$0	0.890	$0
3		$0	$0	$0	0.840	$0
4		$0	$0	$0	0.792	$0
5		$0	$7,375	$7,375	0.747	$5,511
6		$0	$0	$0	0.705	$0
7		$0	$0	$0	0.665	$0
8		$0	$0	$0	0.627	$0
9		$0	$0	$0	0.592	$0
10		$0	$7,375	$7,375	0.558	$4,118
11		$0	$0	$0	0.527	$0
12		$0	$0	$0	0.497	$0
13		$0	$0	$0	0.469	$0
14		$0	$0	$0	0.442	$0
15		$0	$7,375	$7,375	0.417	$3,077
16		$0	$0	$0	0.394	$0
17		$0	$0	$0	0.371	$0
18		$0	$0	$0	0.350	$0
19		$0	$0	$0	0.331	$0
20		$0	$7,375	$7,375	0.312	$2,300
21		$0	$0	$0	0.294	$0
22		$0	$0	$0	0.278	$0
23		$0	$0	$0	0.262	$0
24		$0	$0	$0	0.247	$0
25		$0	$7,375	$7,375	0.233	$1,718
26		$0	$0	$0	0.220	$0
27		$0	$0	$0	0.207	$0
28		$0	$0	$0	0.196	$0
29		$0	$0	$0	0.185	$0
30		$0	$7,375	$7,375	0.174	$1,284
					TOTAL PRESENT WORTH	**$18,008**

Table D2-1

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 12
SOIL ALTERNATIVE 2: LAND USE CONTROLS AND MONITORING
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Corrective Measures Implementation Plar	40	hr			$33.79		$0	$0	$1,352	$0	$1,352
1.2 Project Scheduling and Procurement	8	hr			$33.79		$0	$0	$270	$0	$270
2 LAND USE CONTROLS											
2.1 Site Survey (2-man crew)	3	days	$648.36				$1,945	$0	$0	$0	$1,945
2.2 Prepare Land Use Plan	100	hours			$33.79		$0	$0	$3,379	$0	$3,379
2.3 Modify Master Plan and Prepare Deed Restriction:	80	hours			$33.79		$0	$0	$2,703	$0	$2,703
3 Professional Services											
3.1 Drawings Prep. And Engineering Oversight	40	hr			$33.79		$0	$0	$1,352	$0	$1,352
Subtotal Direct Capital Costs less Subcontract								$0	$7,704	$0	$7,704
Local Area Adjustment								123%	88%	123%	
								$0	$6,772	$0	$6,772
Overhead on Labor Cost @ 30%									$2,032		$2,032
G & A on Labor Cost @ 10%									$677		$677
G & A on Material Cost @ 10%								$0			$0
Total Direct Capital Cost								$0	$9,481	$0	$9,481
Indirects on Total Direct Labor Cost @ 75%									$7,111		$7,111
Profit on Total Direct Cost @ 10%											$948
Subtotal											$17,539
Health & Safety Monitoring @ 3%	(Includes Subcontractor cost)										$585
Health & Safety Training, Site-specific Training											$585
Total Field Cost											**$18,708**
Subtotal Subcontractor Cost							$1,945				$1,945
G & A on Subcontract Cost @ 10%							$195				$195
Profit on Subcontractor Cost @ 5%											$97
Subcontractor Cost											**$2,237**
Contingency on Total Field and Subcontractor Costs @ 10%											**$2,095**
Engineering on Total Field and Subcontractor Costs @ 5%											**$1,047**
TOTAL Capital COST											**$24,087**

Assumptions: No cover maintenance. No additional soil sampling would be performed.

Table D2-2

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 12
SOIL ALTERNATIVE 2: LAND USE CONTROLS AND MONITORING
Operation and Maintenance Costs per Year

	Item	Qty	Unit	Unit Cost	Subtotal Cost	Notes
1	Energy - Electric		kWh	$0.06	$0	
2	Maintenance of Existing Cover	0	cap	$1,000.00	$0	
3	Carbon Unit Changeout/Regeneration of Spent Carbon		pound	$3.00	$0	once a year
4	Labor, Mobilization/Demobilization, Per Diem, Supplies		wk	$925.00	$0	1 visit per week - 1 day
5	Labor, Mobilization/Demobilization, Per Diem, Supplies		mo	$1,950.00	$0	1 visit per quarter - 2 laborers, 2 days
6	Analysis of Off-gas samples		ea	$250.00	$0	1 per month, VOCs
7	Quarterly Reports		ea	$4,000.00	$0	
	Total Cost for One Year Operation				$0	

Table D2-3

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 12
SOIL ALTERNATIVE 2: LAND USE CONTROLS AND MONITORING
ANNUAL COSTS

Cost Item	Quantity	Unit	Unit Cost[a]	Total Cost
1 FIVE YEAR SITE REVIEW				
1.1 Site Review Meeting (2-persons for 2-days)				
Project Manager	16	hr	$76.00	$1,216
Staff Engineer	16	hr	$52.04	$833
ODCs (travel, etc.)	1	ls	$800.00	$800
1.2 Review Report				
Project Manager	16	hr	$76.00	$1,216
Staff Engineer	32	hr	$52.04	$1,665
ODCs (photocopies, telephone, etc.)	1	ls	$100.00	$100
Subtotal Review Cost				$5,830
G&A and Profit @ 15%				$874
Subtotal				$6,704
Total for Review Cost				**$6,704**
2 LAND USE CONTROL MONITORING (FOR 30 YEAR PERIOD)				
2.1 Quarterly Site Inspections				
Project Manager (2 hrs for each Inspection)	8	hr	$76.00	$608
ODCs (travel, etc.)	1	ls	$1,000.00	$1,000
2.2 Annual Review and Report				
Project Manager	12	hr	$38.00	$912
Staff Engineer	12	hr	$52.04	$624
ODCs (photocopies, telephone, etc.)	1	ls	$100.00	$100
Subtotal Land Use Control Monitoring				$3,244
G&A and Profit @ 15%				$487
Subtotal				$3,731
Total Land Use Control Monitoring Cost				**$3,731**

[a] includes overhead on professional labor @ 100%.

Table D2-4

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 12
SOIL ALTERNATIVE 2: LAND USE CONTROLS AND MONITORING
PRESENT WORTH ANALYSIS

Year	Capital Cost	Operation and Maintenance Cost	Annual Cost	Total Yearly Cost	Present-Worth Factor (i = 7%)	Present Worth
0	$24,087			$24,087	1.000	$24,087
1		$0	$3,731	$3,731	0.935	$3,489
2		$0	$3,731	$3,731	0.873	$3,257
3		$0	$3,731	$3,731	0.816	$3,045
4		$0	$3,731	$3,731	0.763	$2,847
5		$0	$10,436	$10,436	0.713	$7,441
6		$0	$3,731	$3,731	0.666	$2,485
7		$0	$3,731	$3,731	0.623	$2,325
8		$0	$3,731	$3,731	0.582	$2,172
9		$0	$3,731	$3,731	0.544	$2,030
10		$0	$10,436	$10,436	0.508	$5,301
11		$0	$3,731	$3,731	0.475	$1,772
12		$0	$3,731	$3,731	0.444	$1,657
13		$0	$3,731	$3,731	0.415	$1,548
14		$0	$3,731	$3,731	0.388	$1,448
15		$0	$10,436	$10,436	0.362	$3,778
16		$0	$3,731	$3,731	0.339	$1,265
17		$0	$3,731	$3,731	0.317	$1,183
18		$0	$3,731	$3,731	0.296	$1,104
19		$0	$3,731	$3,731	0.277	$1,034
20		$0	$10,436	$10,436	0.258	$2,692
21		$0	$3,731	$3,731	0.242	$903
22		$0	$3,731	$3,731	0.226	$843
23		$0	$3,731	$3,731	0.211	$787
24		$0	$3,731	$3,731	0.197	$735
25		$0	$10,436	$10,436	0.184	$1,920
26		$0	$3,731	$3,731	0.172	$642
27		$0	$3,731	$3,731	0.161	$601
28		$0	$3,731	$3,731	0.150	$560
29		$0	$3,731	$3,731	0.141	$526
30		$0	$10,436	$10,436	0.131	$1,367
					TOTAL PRESENT WORTH	**$84,842**

SWMU 17

CARBONACEOUS FUEL BOILER AREA

APPENDIX D2

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 17
SOIL ALTERNATIVE 1: NO ACTION
CAPITAL COSTS

TABLE D3-1

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Remedial Action Plan		hr			$33.79		$0	$0	$0	$0	$0
2 MOBILIZATION/DEMOBILIZATION											
2 Equipment Mob/Demob (Exc. & Dozier)		ea			$200.00	$250.00	$0	$0	$0	$0	$0
2 Mobilize/Demobilize Personnel (2-persons)		ea		$375.00	$300.00		$0	$0	$0	$0	$0
2.3 Portable Toilet		mo	$74.18				$0	$0	$0	$0	$0
2.4 Storage Trailer (28' x 10')		mo	$98.33				$0	$0	$0	$0	$0
3 DECONTAMINATION											
3.1 Temporary Decon Pad		ls		$450.00	$400.00	$155.00	$0	$0	$0	$0	$0
3.2 Decon Water Disposal		drum	$125.00				$0	$0	$0	$0	$0
3.3 Decon Water Storage Drums		ea		$45.00			$0	$0	$0	$0	$0
3.4 PPE (2 p * 5 days * 2 Weeks)		m-day		$30.00			$0	$0	$0	$0	$0
3.5 Decontaminate Equipment (Pressure Washer)		ea			$134.45	$50.00	$0	$0	$0	$0	$0
4 SITE PREPARATION											
4.1 Erosion Control Fencing		lf		$0.23	$1.17		$0	$0	$0	$0	$0
4.2 Collect/Analyze Delineation Samples (inorganics)		ea	$305.00	$10.00	$23.52		$0	$0	$0	$0	$0
4.3 Construction Surveys (2-man crew)		day	$648.36				$0	$0	$0	$0	$0
4.4 Utility Location and Site Delineation/Layout		hrs			$33.23		$0	$0	$0	$0	$0
5 EXCAVATION/BACKFILL											
5.1 Excavate/Load Contaminated Soil (1.0 cy Hyd. Excavator		cy			$1.27	$2.23	$0	$0	$0	$0	$0
5.2 Standby, Crawler Mounted 1.0 CY Hydraulic Excavator		hrs				$20.50	$0	$0	$0	$0	$0
5.3 Health & Safety Monitoring with OVA during Excavation		day			$188.16	$100.00	$0	$0	$0	$0	$0
5.4 Collect/Analyze Confirmatory Samples		ea	$305.00	$10.00	$23.52		$0	$0	$0	$0	$0
5.5 Import (Offsite) Place, Compact Clean Fill Material		cy		$7.82	$0.85	$1.81	$0	$0	$0	$0	$0
6 OFF-SITE TRANSPORTATION/DISPOSAL											
6.1 Waste Profile		ls	$750.00				$0	$0	$0	$0	$0
6.2 Transport and Dispose of Soil (Non-hazardous) in Landfi		ton	$45.00				$0	$0	$0	$0	$0
6.3 Prepare Shipment Manifests		hrs			$33.23		$0	$0	$0	$0	$0
7 SITE RESTORATION											
7.1 Import Vegetative Cover Material (Topsoil)		cy		$15.00			$0	$0	$0	$0	$0
7.2 Place/Grade Topsoil (6")		day			$227.20	$435.00	$0	$0	$0	$0	$0
7.3 Sod Disturbed Area		acre	#########				$0	$0	$0	$0	$0
8 LAND USE CONTROLS											
8.1 Site Survey (2-man crew)		days	$648.36				$0	$0	$0	$0	$0
8.2 Prepare Land Use Plan		hours			$33.79		$0	$0	$0	$0	$0
8.3 Modify Master Plan and Prepare Deed Restrictions		hours			$33.79		$0	$0	$0	$0	$0
Subtotal Direct Capital Costs less Subcontract								$0	$0	$0	$0
Local Area Adjustment								84%	84%	84%	
								$0	$0	$0	$0
Overhead on Labor Cost @ 30%									$0		$0
G & A on Labor Cost @ 10%									$0		$0
G & A on Material Cost @ 10%								$0			$0
Total Direct Capital Cost								$0	$0	$0	$0

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 17
SOIL ALTERNATIVE 1: NO ACTION
CAPITAL COSTS

TABLE D3-1

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
Indirects on Total Direct Labor Cost @ 75%									$0		$0
Profit on Total Direct Cost @ 10%											$0
Subtotal											$0
Health & Safety Monitoring @ 3%		(Includes Subcontractor cost)									$0
Total Field Cost											**$0**
Subtotal Subcontractor Cost							$0				$0
G & A on Subcontract Cost @ 10%							$0				$0
Profit on Subcontractor Cost @ 5%											$0
Subcontractor Cost											**$0**
tingency on Total Field and Subcontractor Costs @ 10%											**$0**
ineering on Total Field and Subcontractor Costs @ 5%											**$0**
TOTAL Capital COST											**$0**

TABLE D3-2

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 17
SOIL ALTERNATIVE 1: NO ACTION
Operation and Maintenance Costs per Year

	Item	Qty	Unit	Unit Cost	Subtotal Cost	Notes
1	Energy - Electric		kWh	$0.06	$0	
2	Maintenance		ls		$0	5% of Installation Cost
3	Carbon Unit Changeout/Regeneration of Spent Carbon		pound	$3.00	$0	once a year
4	Labor, Mobilization/Demobilization, Per Diem, Supplies		wk	$925.00	$0	1 visit per week - 1 day
5	Labor, Mobilization/Demobilization, Per Diem, Supplies		mo	$1,950.00	$0	1 visit per quarter - 2 laborers, 2 days
6	Analysis of Off-gas samples		ea	$250.00	$0	1 per month, VOCs
7	Quarterly Reports		ea	$4,000.00	$0	
	Total Cost for One Year Operation				$0	

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 17
SOIL ALTERNATIVE 1: NO ACTION
ANNUAL COSTS

TABLE D3-3

Cost Item	Quantity	Unit	Unit Cost	Labor Overhead[a]	Total Cost
1 FIVE YEAR SITE REVIEWS (FOR 30 YEAR PERIOD)					
1.1 Site Review Meeting (2-persons for 2-days)					
Project Manager	16	hr	$38.00	$38.00	$1,216
Staff Engineer	16	hr	$26.02	$26.02	$833
ODCs (travel, etc.)	1	ls	$800.00		$800
1.2 Five Year Review Report					
Project Manager	16	hr	$38.00	$38.00	$1,216
Staff Engineer	32	hr	$26.02	$26.02	$1,665
ODCs (photocopies, telephone, etc.)	1	ls	$100.00		$100
Subtotal Five Year Review Cost					$5,830
G&A and Profit @ 15%					$874
Subtotal					$6,704
Contingency @ 10%					$670.44
Total Five Year Review Cost					**$7,375**

[a] Overhead on professional labor @ 100%.

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 17

TABLE D3-4

SOIL ALTERNATIVE 1: NO ACTION
PRESENT WORTH ANALYSIS

Year	Capital Cost	Operation and Maintenance Cost	Annual Cost	Total Yearly Cost	Present-Worth Factor (i = 6%)	Present Worth
0	$0			$0	1.000	$0
1		$0	$0	$0	0.943	$0
2		$0	$0	$0	0.890	$0
3		$0	$0	$0	0.840	$0
4		$0	$0	$0	0.792	$0
5		$0	$7,375	$7,375	0.747	$5,511
6		$0	$0	$0	0.705	$0
7		$0	$0	$0	0.665	$0
8		$0	$0	$0	0.627	$0
9		$0	$0	$0	0.592	$0
10		$0	$7,375	$7,375	0.558	$4,118
11		$0	$0	$0	0.527	$0
12		$0	$0	$0	0.497	$0
13		$0	$0	$0	0.469	$0
14		$0	$0	$0	0.442	$0
15		$0	$7,375	$7,375	0.417	$3,077
16		$0	$0	$0	0.394	$0
17		$0	$0	$0	0.371	$0
18		$0	$0	$0	0.350	$0
19		$0	$0	$0	0.331	$0
20		$0	$7,375	$7,375	0.312	$2,300
21		$0	$0	$0	0.294	$0
22		$0	$0	$0	0.278	$0
23		$0	$0	$0	0.262	$0
24		$0	$0	$0	0.247	$0
25		$0	$7,375	$7,375	0.233	$1,718
26		$0	$0	$0	0.220	$0
27		$0	$0	$0	0.207	$0
28		$0	$0	$0	0.196	$0
29		$0	$0	$0	0.185	$0
30		$0	$7,375	$7,375	0.174	$1,284
					TOTAL PRESENT WORTH	**$18,008**

Table D4-1

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 2: LAND USE CONTROLS, MONITORING
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Corrective Measures Implementation Plar	40	hr			$33.79		$0	$0	$1,352	$0	$1,352
1.2 Project Scheduling and Procurement	8	hr			$33.79		$0	$0	$270	$0	$270
2 LAND USE CONTROLS											
2.1 Site Survey (2-man crew)	3	days	$648.36				$1,945	$0	$0	$0	$1,945
2.2 Prepare Land Use Plan	100	hours			$33.79		$0	$0	$3,379	$0	$3,379
2.3 Modify Master Plan and Prepare Deed Restriction!	80	hours			$33.79		$0	$0	$2,703	$0	$2,703
3 Professional Services											
3.1 Drawings Prep. And Engineering Oversight	40	hr			$33.79		$0	$0	$1,352	$0	$1,352
Subtotal Direct Capital Costs less Subcontract								$0	$7,704	$0	$7,704
Local Area Adjustment								123%	88%	123%	
								$0	$6,772	$0	$6,772
Overhead on Labor Cost @ 30%									$2,032		$2,032
G & A on Labor Cost @ 10%									$677		$677
G & A on Material Cost @ 10%								$0			$0
Total Direct Capital Cost								$0	$9,481	$0	$9,481
Indirects on Total Direct Labor Cost @ 75%									$7,111		$7,111
Profit on Total Direct Cost @ 10%											$948
Subtotal											$17,539
Health & Safety Monitoring @ 3%		(Includes Subcontractor cost)									$585
Health & Safety Training, Site-specific Training											$585
Total Field Cost											**$18,708**
Subtotal Subcontractor Cost							$1,945				$1,945
G & A on Subcontract Cost @ 10%							$195				$195
Profit on Subcontractor Cost @ 5%											$97
Subcontractor Cost											**$2,237**
Contingency on Total Field and Subcontractor Costs @ 10%											**$2,095**
Engineering on Total Field and Subcontractor Costs @ 5%											**$1,047**
TOTAL Capital COST											**$24,087**

Assumptions: No cover maintenance. No additional sampling would be performed. Groundwater monitoring woul be conducted as part of groundwater alternative.

Table D4-2

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 2: LAND USE CONTROLS, MONITORING
Operation and Maintenance Costs per Year

	Item	Qty	Unit	Unit Cost	Subtotal Cost	Notes
1	Energy - Electric		kWh	$0.06	$0	
2	Maintenance of Existing Cover	0	cap	$1,000.00	$0	
3	Carbon Unit Changeout/Regeneration of Spent Carbon		pound	$3.00	$0	once a year
4	Labor, Mobilization/Demobilization, Per Diem, Supplies		wk	$925.00	$0	1 visit per week - 1 day
5	Labor, Mobilization/Demobilization, Per Diem, Supplies		mo	$1,950.00	$0	1 visit per quarter - 2 laborers, 2 days
6	Analysis of Off-gas samples		ea	$250.00	$0	1 per month, VOCs
7	Quarterly Reports		ea	$4,000.00	$0	
	Total Cost for One Year Operation				$0	

Table D4-3

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 2: LAND USE CONTROLS, MONITORING
ANNUAL COSTS

Cost Item	Quantity	Unit	Unit Cost[a]	Total Cost
1 FIVE YEAR SITE REVIEW				
1.1 Site Review Meeting (2-persons for 2-days)				
Project Manager	16	hr	$76.00	$1,216
Staff Engineer	16	hr	$52.04	$833
ODCs (travel, etc.)	1	ls	$800.00	$800
1.2 Review Report				
Project Manager	16	hr	$76.00	$1,216
Staff Engineer	32	hr	$52.04	$1,665
ODCs (photocopies, telephone, etc.)	1	ls	$100.00	$100
Subtotal Review Cost				$5,830
G&A and Profit @ 15%				$874
Subtotal				$6,704
Total for Review Cost				**$6,704**
2 LAND USE CONTROL MONITORING (FOR 30 YEAR PERIOD)				
2.1 Quarterly Site Inspections				
Project Manager (2 hrs for each Inspection)	8	hr	$76.00	$608
ODCs (travel, etc.)	1	ls	$1,000.00	$1,000
2.2 Annual Review and Report				
Project Manager	12	hr	$38.00	$912
Staff Engineer	12	hr	$52.04	$624
ODCs (photocopies, telephone, etc.)	1	ls	$100.00	$100
Subtotal Land Use Control Monitoring				$3,244
G&A and Profit @ 15%				$487
Subtotal				$3,731
Total Land Use Control Monitoring Cost				**$3,731**

[a] includes overhead on professional labor @ 100%.

Table D4-4

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 2: LAND USE CONTROLS, MONITORING
PRESENT WORTH ANALYSIS

Year	Capital Cost	Operation and Maintenance Cost	Annual Cost	Total Yearly Cost	Present-Worth Factor (i = 7%)	Present Worth
0	$24,087			$24,087	1.000	$24,087
1		$0	$3,731	$3,731	0.935	$3,489
2		$0	$3,731	$3,731	0.873	$3,257
3		$0	$3,731	$3,731	0.816	$3,045
4		$0	$3,731	$3,731	0.763	$2,847
5		$0	$10,436	$10,436	0.713	$7,441
6		$0	$3,731	$3,731	0.666	$2,485
7		$0	$3,731	$3,731	0.623	$2,325
8		$0	$3,731	$3,731	0.582	$2,172
9		$0	$3,731	$3,731	0.544	$2,030
10		$0	$10,436	$10,436	0.508	$5,301
11		$0	$3,731	$3,731	0.475	$1,772
12		$0	$3,731	$3,731	0.444	$1,657
13		$0	$3,731	$3,731	0.415	$1,548
14		$0	$3,731	$3,731	0.388	$1,448
15		$0	$10,436	$10,436	0.362	$3,778
16		$0	$3,731	$3,731	0.339	$1,265
17		$0	$3,731	$3,731	0.317	$1,183
18		$0	$3,731	$3,731	0.296	$1,104
19		$0	$3,731	$3,731	0.277	$1,034
20		$0	$10,436	$10,436	0.258	$2,692
21		$0	$3,731	$3,731	0.242	$903
22		$0	$3,731	$3,731	0.226	$843
23		$0	$3,731	$3,731	0.211	$787
24		$0	$3,731	$3,731	0.197	$735
25		$0	$10,436	$10,436	0.184	$1,920
26		$0	$3,731	$3,731	0.172	$642
27		$0	$3,731	$3,731	0.161	$601
28		$0	$3,731	$3,731	0.150	$560
29		$0	$3,731	$3,731	0.141	$526
30		$0	$10,436	$10,436	0.131	$1,367
					TOTAL PRESENT WORTH	**$84,842**

Table D5-1

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 3: LAND USE CONTROLS, MONITORING, CAPPING
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Corrective Measures Implementation Plan	200	hr			$33.79		$0	$0	$6,758	$0	$6,758
1.2 Project Scheduling and Procurement	40	hr			$33.79		$0	$0	$1,352	$0	$1,352
2 MOBILIZATION/DEMOBILIZATION											
2 Equipment Mob/Demob	2	ea			$200.00	$250.00	$0	$0	$400	$500	$900
2 Mobilize/Demobilize Personnel (2-persons)	2	ea		$375.00	$300.00		$0	$750	$600	$0	$1,350
2.3 Portable Toilet	1	mo	$74.18				$74	$0	$0	$0	$74
2.4 Storage Trailer (28' x 10')	1	mo	$98.33				$98	$0	$0	$0	$98
3 DECONTAMINATION											
3.1 Temporary Decon Pad	1	ls		$450.00	$400.00	$155.00	$0	$450	$400	$155	$1,005
3.2 Decon Water Disposal	5	drum	$125.00				$625	$0	$0	$0	$625
3.3 Decon Water Storage Drums	5	ea		$45.00			$0	$225	$0	$0	$225
3.4 PPE (2 p * 5 days * 2 Weeks)	20	m-day		$30.00			$0	$600	$0	$0	$600
3.5 Decontaminate Equipment (Pressure Washer)	2	ea			$134.45	$50.00	$0	$0	$269	$100	$369
4 SITE PREPARATION											
4.1 Erosion Control Fencing	1000	lf		$0.23	$1.17		$0	$230	$1,170	$0	$1,400
4.2 Construction Surveys (2-man crew)	2	day	$648.36				$1,297	$0	$0	$0	$1,297
4.3 Utility Location and Site Delineation/Layout	24	hrs			$33.23		$0	$0	$798	$0	$798
5 ASPHALT COVER											
5.1 Place Asphalt Cover	890	sq.yd	$22.15				$19,714	$0	$0	$0	$19,714
(10"subgrade,9" base, 1.5" Topping)						$20.50	$0	$0	$0	$0	$0
5.2 Health & Safety Monitoring	10	day			$188.16	$100.00	$0	$0	$1,882	$1,000	$2,882
6 SITE RESTORATION											
6.1 Cleanup areas surrounding the cap	5	day			$227.20	$435.00	$0	$0	$1,136	$2,175	$3,311
6.2 Sod Disturbed Area	0.1	acre	##########				$2,086	$0	$0	$0	$2,086
7 LAND USE CONTROLS											
7.1 Site Survey (2-man crew)	3	days	$648.36				$1,945	$0	$0	$0	$1,945
7.2 Prepare Land Use Plan	100	hours			$33.79		$0	$0	$3,379	$0	$3,379
7.3 Modify Master Plan and Prepare Deed Restrictions	80	hours			$33.79		$0	$0	$2,703	$0	$2,703
8 Professional Services											
8.1 Drawings Prep. And Engineering Oversight	120	hr			$33.79		$0	$0	$4,055	$0	$4,055
Subtotal Direct Capital Costs less Subcontract								$2,255	$20,846	$3,930	$27,031
Local Area Adjustment								123%	88%	123%	
								$2,762	$18,323	$4,830	$25,916
Overhead on Labor Cost @ 30%									$5,497		$5,497
G & A on Labor Cost @ 10%									$1,832		$1,832
G & A on Material Cost @ 10%								$276			$276
Total Direct Capital Cost								$3,039	$25,653	$4,830	$33,521

Table D5-1

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 3: LAND USE CONTROLS, MONITORING, CAPPING
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
Indirects on Total Direct Labor Cost @ 75%									$19,240		$19,240
Profit on Total Direct Cost @ 10%											$3,352
Subtotal											$56,113
Health & Safety Monitoring @ 3%		(Includes Subcontractor cost)									$2,459
Health & Safety Training, Site-specific Training											$2,459
Total Field Cost											$61,030
Subtotal Subcontractor Cost							$25,839				$25,839
G & A on Subcontract Cost @ 10%							$2,584				$2,584
Profit on Subcontractor Cost @ 5%											$1,292
Subcontractor Cost											**$29,715**
Contingency on Total Field and Subcontractor Costs @ 10%											**$9,074**
Engineering on Total Field and Subcontractor Costs @ 5%											**$4,537**
TOTAL Capital COST											**$104,357**

Assumptions: The site is mostly paved except for few hot spot areas that would be paved under this alternative. The new cover would be maintained. Groundwater monitoring would be conducted as part of groundwater alternative.

Table D5-2

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 3: LAND USE CONTROLS, MONITORING, CAPPING
Operation and Maintenance Costs per Year

	Item	Qty	Unit	Unit Cost	Subtotal Cost	Notes
1	Energy - Electric		kWh	$0.06	$0	
2	Maintenance of Cap	0.01	cap	#########	$197	1% of Installation Cost
	Total Cost for One Year Operation				$197	

Table D5-3

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 3: LAND USE CONTROLS, MONITORING, CAPPING
ANNUAL COSTS

Cost Item	Quantity	Unit	Unit Cost[a]	Total Cost
1 FIVE YEAR SITE REVIEW				
1.1 Site Review Meeting (2-persons for 2-days)				
Project Manager	16	hr	$76.00	$1,216
Staff Engineer	16	hr	$52.04	$833
ODCs (travel, etc.)	1	ls	$800.00	$800
1.2 Review Report				
Project Manager	16	hr	$76.00	$1,216
Staff Engineer	32	hr	$52.04	$1,665
ODCs (photocopies, telephone, etc.)	1	ls	$100.00	$100
Subtotal Review Cost				$5,830
G&A and Profit @ 15%				$874
Subtotal				$6,704
Total for Review Cost				**$6,704**
2 LAND USE CONTROL MONITORING (FOR 30 YEAR PERIOD)				
2.1 Quarterly Site Inspections				
Project Manager (2 hrs for each Inspection)	8	hr	$76.00	$608
ODCs (travel, etc.)	1	ls	$1,000.00	$1,000
2.2 Annual Review and Report				
Project Manager	12	hr	$76.00	$912
Staff Engineer	12	hr	$52.04	$624
ODCs (photocopies, telephone, etc.)	1	ls	$100.00	$100
Subtotal Land Use Control Monitoring				$3,244
G&A and Profit @ 15%				$487
Subtotal				$3,731
Total Land Use Control Monitoring Cost				**$3,731**

[a] includes overhead on professional labor @ 100%.

Table D5-4

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 3: LAND USE CONTROLS, MONITORING, CAPPING
PRESENT WORTH ANALYSIS

Year	Capital Cost	Operation and Maintenance Cost	Annual Cost	Total Yearly Cost	Present-Worth Factor (i = 7%)	Present Worth
0	$104,357			$104,357	1.000	$104,357
1		$197	$3,731	$3,928	0.935	$3,673
2		$197	$3,731	$3,928	0.873	$3,429
3		$197	$3,731	$3,928	0.816	$3,205
4		$197	$3,731	$3,928	0.763	$2,997
5		$197	$10,436	$10,633	0.713	$7,581
6		$197	$3,731	$3,928	0.666	$2,616
7		$197	$3,731	$3,928	0.623	$2,447
8		$197	$3,731	$3,928	0.582	$2,286
9		$197	$3,731	$3,928	0.544	$2,137
10		$197	$10,436	$10,633	0.508	$5,401
11		$197	$3,731	$3,928	0.475	$1,866
12		$197	$3,731	$3,928	0.444	$1,744
13		$197	$3,731	$3,928	0.415	$1,630
14		$197	$3,731	$3,928	0.388	$1,524
15		$197	$10,436	$10,633	0.362	$3,849
16		$197	$3,731	$3,928	0.339	$1,332
17		$197	$3,731	$3,928	0.317	$1,245
18		$197	$3,731	$3,928	0.296	$1,163
19		$197	$3,731	$3,928	0.277	$1,088
20		$197	$10,436	$10,633	0.258	$2,743
21		$197	$3,731	$3,928	0.242	$951
22		$197	$3,731	$3,928	0.226	$888
23		$197	$3,731	$3,928	0.211	$829
24		$197	$3,731	$3,928	0.197	$774
25		$197	$10,436	$10,633	0.184	$1,956
26		$197	$3,731	$3,928	0.172	$676
27		$197	$3,731	$3,928	0.161	$632
28		$197	$3,731	$3,928	0.150	$589
29		$197	$3,731	$3,928	0.141	$554
30		$197	$10,436	$10,633	0.131	$1,393
					TOTAL PRESENT WORTH	**$167,557**

Table D6-1

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 4: LAND USE CONTROLS, REMOVAL, AND TSDF DISPOSAL
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost				Extended Cost				
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Corrective Measures Implementation Plar	200	hr			$33.79		$0	$0	$6,758	$0	$6,758
1.2 Project Scheduling and Procurement	40	hr			$33.79		$0	$0	$1,352	$0	$1,352
2 MOBILIZATION/DEMOBILIZATION											
2 Equipment Mob/Demob (Exc. & Dozier)	2	ea			$200.00	$250.00	$0	$0	$400	$500	$900
2 Mobilize/Demobilize Personnel (2-persons)	2	ea		$375.00	$300.00		$0	$750	$600	$0	$1,350
2.3 Portable Toilet	1	mo	$74.18				$74	$0	$0	$0	$74
2.4 Storage Trailer (28' x 10')	1	mo	$98.33				$98	$0	$0	$0	$98
3 DECONTAMINATION											
3.1 Temporary Decon Pad	4	ls		$450.00	$400.00	$155.00	$0	$1,800	$1,600	$620	$4,020
3.2 Decon Water Disposal	50	drum	$125.00				$6,250	$0	$0	$0	$6,250
3.3 Decon Water Storage Drums	50	ea		$45.00			$0	$2,250	$0	$0	$2,250
3.4 PPE (2 p * 5 days * 2 Weeks)	30	n-day		$30.00			$0	$900	$0	$0	$900
3.5 Decontaminate Equipment (Pressure Washer)	4	ea			$134.45	$50.00	$0	$0	$538	$200	$738
4 SITE PREPARATION											
4.1 Erosion Control Fencing	1000	lf		$0.23	$1.17		$0	$230	$1,170	$0	$1,400
4.2 Collect/Analyze Delineation Samples (SVOCs and	10	ea	$370.00	$10.00	$23.52		$3,700	$100	$235	$0	$4,035
4.3 Construction Surveys (2-man crew)	5	day	$648.36				$3,242	$0	$0	$0	$3,242
4.4 Utility Location and Site Delineation/Layout	24	hrs			$33.23		$0	$0	$798	$0	$798
5 EXCAVATION/BACKFILL											
5.1 Excavate/Load Contaminated Soil (1.0 cy Hyd. Exc	1165	cy			$1.27	$2.23	$0	$0	$1,480	$2,598	$4,078
5.2 Standby, Crawler Mounted 1.0 CY Hydraulic Excav	24	hrs				$20.50	$0	$0	$0	$492	$492
5.3 Health & Safety Monitoring with OVA during Excav	20	day			$188.16	$100.00	$0	$0	$3,763	$2,000	$5,763
5.4 Collect/Analyze Confirmatory Samples	10	ea	$370.00	$10.00	$23.52		$3,700	$100	$235	$0	$4,035
5.5 Import (Offsite) Place, Compact Clean Fill Material	1400	cy		$7.82	$0.85	$1.81	$0	$10,948	$1,190	$2,534	$14,672
6 OFF-SITE TRANSPORTATION/DISPOSAL											
6.1 Waste Profile	10	ls	$750.00				$7,500	$0	$0	$0	$7,500
6.2 Transport and Dispose of Soil (hazard.) in Landfill	2100	ton	$175.00				$367,500	$0	$0	$0	$367,500
6.3 Prepare Shipment Manifests	100	hrs			$33.23		$0	$0	$3,323	$0	$3,323
7 SITE RESTORATION											
7.1 Import Vegetative Cover Material (Backfill and Top	700	cy		$15.00			$0	$10,500	$0	$0	$10,500
7.2 Place/Grade Topsoil (6")	5	day			$227.20	$435.00	$0	$0	$1,136	$2,175	$3,311
7.3 Sod Disturbed Area	0.1	acre	#########				$2,086	$0	$0	$0	$2,086
8 LAND USE CONTROLS											
8.1 Site Survey (2-man crew)	3	days	$648.36				$1,945	$0	$0	$0	$1,945
8.2 Prepare Land Use Plan	100	hours			$33.79		$0	$0	$3,379	$0	$3,379
8.3 Modify Master Plan and Prepare Deed Restrictions	80	hours			$33.79		$0	$0	$2,703	$0	$2,703
9 Professional Services											
9.1 Drawings Prep. And Engineering Oversight	80	hr			$33.79		$0	$0	$2,703	$0	$2,703
Subtotal Direct Capital Costs less Subcontract								$27,578	$30,659	$11,119	$69,356
Local Area Adjustment								123%	88%	123%	
								$33,783	$26,949	$13,665	$74,398
Overhead on Labor Cost @ 30%									$8,085		$8,085
G & A on Labor Cost @ 10%									$2,695		$2,695
G & A on Material Cost @ 10%								$3,378			$3,378
Total Direct Capital Cost								$37,161	$37,729	$13,665	$88,556

Table D6-1

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 4: LAND USE CONTROLS, REMOVAL, AND TSDF DISPOSAL
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
Indirects on Total Direct Labor Cost @	75%								$28,297		$28,297
Profit on Total Direct Cost @	10%										$8,856
Subtotal											$125,708
Health & Safety Monitoring @	3%		(Includes Subcontractor cost)								$15,654
Health & Safety Training, Site-specific Training											$15,654
Total Field Cost											$157,017
Subtotal Subcontractor Cost							$396,095				$396,095
G & A on Subcontract Cost @	10%						$39,610				$39,610
Profit on Subcontractor Cost @	5%										$19,805
Subcontractor Cost											**$455,510**
Contingency on Total Field and Subcontractor Costs @	10%										**$61,253**
Engineering on Total Field and Subcontractor Costs @	5%										**$30,626**
TOTAL Capital COST											**$704,405**

Assumptions: The contaminated areas would be excavated and the soil would be disposed of in TSD Facilities. Sampling would be performed to delineate the contaminated areas. No long term groundwater monitoring would be needed.

Table D6-2

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 4: LAND USE CONTROLS, REMOVAL, AND TSDF DISPOSAL
Operation and Maintenance Costs per Year

Item	Qty	Unit	Unit Cost	Subtotal Cost	Notes
Total Cost for One Year Operation				$0	

Table D6-3

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 4: LAND USE CONTROLS, REMOVAL, AND TSDF DISPOSAL
ANNUAL COSTS

Cost Item	Quantity	Unit	Unit Cost[a]	Total Cost
1 FIVE YEAR SITE REVIEW				
1.1 Site Review Meeting (2-persons for 2-days)				
Project Manager	16	hr	$76.00	$1,216
Staff Engineer	16	hr	$52.04	$833
ODCs (travel, etc.)	1	ls	$800.00	$800
1.2 Review Report				
Project Manager	16	hr	$76.00	$1,216
Staff Engineer	32	hr	$52.04	$1,665
ODCs (photocopies, telephone, etc.)	1	ls	$100.00	$100
Subtotal Review Cost				$5,830
G&A and Profit @ 15%				$874
Subtotal				$6,704
Contingency @ 10%				$670.44
Total for Review Cost				**$7,375**
2 LAND USE CONTROL MONITORING (FOR 30 YEAR PERIOD)				
2.1 Quarterly Site Inspections				
Project Manager (2 hrs for each Inspection)	8	hr	$76.00	$608
ODCs (travel, etc.)	1	ls	$1,000.00	$1,000
2.2 Annual Review and Report				
Project Manager	12	hr	$76.00	$912
Staff Engineer	12	hr	$52.04	$624
ODCs (photocopies, telephone, etc.)	1	ls	$100.00	$100
Subtotal Land Use Control Monitoring				$3,244
G&A and Profit @ 15%				$487
Subtotal				$3,731
Contingency @ 10%				$373.12
Total Land Use Control Monitoring Cost				**$4,104**

[a] includes overhead on professional labor @ 100%.

Table D6-4

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
SOIL ALTERNATIVE 4: LAND USE CONTROLS, REMOVAL, AND TSDF DISPOSAL
PRESENT WORTH ANALYSIS

Year	Capital Cost	Operation and Maintenance Cost	Annual Cost	Total Yearly Cost	Present-Worth Factor (i = 7%)	Present Worth
0	$704,405			$704,405	1.000	$704,405
1		$0	$4,104	$4,104	0.935	$3,837
2		$0	$4,104	$4,104	0.873	$3,583
3		$0	$4,104	$4,104	0.816	$3,349
4		$0	$4,104	$4,104	0.763	$3,132
5		$0	$11,479	$11,479	0.713	$8,185
6		$0	$4,104	$4,104	0.666	$2,733
7		$0	$4,104	$4,104	0.623	$2,557
8		$0	$4,104	$4,104	0.582	$2,389
9		$0	$4,104	$4,104	0.544	$2,233
10		$0	$4,104	$4,104	0.508	$2,085
11		$0	$4,104	$4,104	0.475	$1,950
12		$0	$4,104	$4,104	0.444	$1,822
13		$0	$4,104	$4,104	0.415	$1,703
14		$0	$4,104	$4,104	0.388	$1,592
15		$0	$4,104	$4,104	0.362	$1,486
16		$0	$4,104	$4,104	0.339	$1,391
17		$0	$4,104	$4,104	0.317	$1,301
18		$0	$4,104	$4,104	0.296	$1,215
19		$0	$4,104	$4,104	0.277	$1,137
20		$0	$4,104	$4,104	0.258	$1,059
21		$0	$4,104	$4,104	0.242	$993
22		$0	$4,104	$4,104	0.226	$928
23		$0	$4,104	$4,104	0.211	$866
24		$0	$4,104	$4,104	0.197	$809
25		$0	$4,104	$4,104	0.184	$755
26		$0	$4,104	$4,104	0.172	$706
27		$0	$4,104	$4,104	0.161	$661
28		$0	$4,104	$4,104	0.150	$616
29		$0	$4,104	$4,104	0.141	$579
30		$0	$4,104	$4,104	0.131	$538
					TOTAL PRESENT WORTH	**$760,593**

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 1: NO ACTION
CAPITAL COSTS

TABLE D7-1

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Remedial Action Plan		hr			$33.79		$0	$0	$0	$0	$0
2 MOBILIZATION/DEMOBILIZATION											
2 Equipment Mob/Demob (Exc. & Dozier)		ea			$200.00	$250.00	$0	$0	$0	$0	$0
2 Mobilize/Demobilize Personnel (2-persons)		ea		$375.00	$300.00		$0	$0	$0	$0	$0
2.3 Portable Toilet		mo	$74.18				$0	$0	$0	$0	$0
2.4 Storage Trailer (28' x 10')		mo	$98.33				$0	$0	$0	$0	$0
3 DECONTAMINATION											
3.1 Temporary Decon Pad		ls		$450.00	$400.00	$155.00	$0	$0	$0	$0	$0
3.2 Decon Water Disposal		drum	$125.00				$0	$0	$0	$0	$0
3.3 Decon Water Storage Drums		ea		$45.00			$0	$0	$0	$0	$0
3.4 PPE (2 p * 5 days * 2 Weeks)		m-day		$30.00			$0	$0	$0	$0	$0
3.5 Decontaminate Equipment (Pressure Washer)		ea			$134.45	$50.00	$0	$0	$0	$0	$0
4 SITE PREPARATION											
4.1 Erosion Control Fencing		lf		$0.23	$1.17		$0	$0	$0	$0	$0
4.2 Collect/Analyze Delineation Samples (inorganics)		ea	$305.00	$10.00	$23.52		$0	$0	$0	$0	$0
4.3 Construction Surveys (2-man crew)		day	$648.36				$0	$0	$0	$0	$0
4.4 Utility Location and Site Delineation/Layout		hrs			$33.23		$0	$0	$0	$0	$0
5 EXCAVATION/BACKFILL											
5.1 Excavate/Load Contaminated Soil (1.0 cy Hyd. Excavator		cy			$1.27	$2.23	$0	$0	$0	$0	$0
5.2 Standby, Crawler Mounted 1.0 CY Hydraulic Excavator		hrs				$20.50	$0	$0	$0	$0	$0
5.3 Health & Safety Monitoring with OVA during Excavation		day			$188.16	$100.00	$0	$0	$0	$0	$0
5.4 Collect/Analyze Confirmatory Samples		ea	$305.00	$10.00	$23.52		$0	$0	$0	$0	$0
5.5 Import (Offsite) Place, Compact Clean Fill Material		cy		$7.82	$0.85	$1.81	$0	$0	$0	$0	$0
6 OFF-SITE TRANSPORTATION/DISPOSAL											
6.1 Waste Profile		ls	$750.00				$0	$0	$0	$0	$0
6.2 Transport and Dispose of Soil (Non-hazardous) in Landfi		ton	$45.00				$0	$0	$0	$0	$0
6.3 Prepare Shipment Manifests		hrs			$33.23		$0	$0	$0	$0	$0
7 SITE RESTORATION											
7.1 Import Vegetative Cover Material (Topsoil)		cy		$15.00			$0	$0	$0	$0	$0
7.2 Place/Grade Topsoil (6")		day			$227.20	$435.00	$0	$0	$0	$0	$0
7.3 Sod Disturbed Area		acre	#########				$0	$0	$0	$0	$0
8 LAND USE CONTROLS											
8.1 Site Survey (2-man crew)		days	$648.36				$0	$0	$0	$0	$0
8.2 Prepare Land Use Plan		hours			$33.79		$0	$0	$0	$0	$0
8.3 Modify Master Plan and Prepare Deed Restrictions		hours			$33.79		$0	$0	$0	$0	$0
Subtotal Direct Capital Costs less Subcontract								$0	$0	$0	$0
Local Area Adjustment								84%	84%	84%	
								$0	$0	$0	$0
Overhead on Labor Cost @ 30%									$0		$0
G & A on Labor Cost @ 10%									$0		$0
G & A on Material Cost @ 10%								$0			$0
Total Direct Capital Cost								$0	$0	$0	$0

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 1: NO ACTION
CAPITAL COSTS

TABLE D7-1

Cost Item	Quantity	Unit	Unit Cost				Extended Cost				Subtotal
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	
Indirects on Total Direct Labor Cost @ 75%									$0		$0
Profit on Total Direct Cost @ 10%											$0
Subtotal											$0
Health & Safety Monitoring @ 3%		(Includes Subcontractor cost)									$0
Total Field Cost											**$0**
Subtotal Subcontractor Cost							$0				$0
G & A on Subcontract Cost @ 10%							$0				$0
Profit on Subcontractor Cost @ 5%											$0
Subcontractor Cost											**$0**
tingency on Total Field and Subcontractor Costs @ 10%											**$0**
ineering on Total Field and Subcontractor Costs @ 5%											**$0**
TOTAL Capital COST											**$0**

TABLE D7-2

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 1: NO ACTION
Operation and Maintenance Costs per Year

	Item	Qty	Unit	Unit Cost	Subtotal Cost	Notes
1	Energy - Electric		kWh	$0.06	$0	
2	Maintenance		ls		$0	5% of Installation Cost
3	Carbon Unit Changeout/Regeneration of Spent Carbon		pound	$3.00	$0	once a year
4	Labor, Mobilization/Demobilization, Per Diem, Supplies		wk	$925.00	$0	1 visit per week - 1 day
5	Labor, Mobilization/Demobilization, Per Diem, Supplies		mo	$1,950.00	$0	1 visit per quarter - 2 laborers, 2 days
6	Analysis of Off-gas samples		ea	$250.00	$0	1 per month, VOCs
7	Quarterly Reports		ea	$4,000.00	$0	
	Total Cost for One Year Operation				$0	

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 1: NO ACTION
ANNUAL COSTS

TABLE D7-3

Cost Item	Quantity	Unit	Unit Cost	Labor Overhead[a]	Total Cost
1 FIVE YEAR SITE REVIEWS (FOR 30 YEAR PERIOD)					
1.1 Site Review Meeting (2-persons for 2-days)					
Project Manager	16	hr	$38.00	$38.00	$1,216
Staff Engineer	16	hr	$26.02	$26.02	$833
ODCs (travel, etc.)	1	ls	$800.00		$800
1.2 Five Year Review Report					
Project Manager	16	hr	$38.00	$38.00	$1,216
Staff Engineer	32	hr	$26.02	$26.02	$1,665
ODCs (photocopies, telephone, etc.)	1	ls	$100.00		$100
Subtotal Five Year Review Cost					$5,830
G&A and Profit @ 15%					$874
Subtotal					$6,704
Contingency @ 10%					$670.44
Total Five Year Review Cost					**$7,375**

[a] Overhead on professional labor @ 100%.

NAVAL STATION MAYPORT
MAYPORT, FLORIDA
SWMU 17

TABLE D7-4

GROUNDWATER ALTERNATIVE 1: NO ACTION
PRESENT WORTH ANALYSIS

Year	Capital Cost	Operation and Maintenance Cost	Annual Cost	Total Yearly Cost	Present-Worth Factor (i = 6%)	Present Worth
0	$0			$0	1.000	$0
1		$0	$0	$0	0.943	$0
2		$0	$0	$0	0.890	$0
3		$0	$0	$0	0.840	$0
4		$0	$0	$0	0.792	$0
5		$0	$7,375	$7,375	0.747	$5,511
6		$0	$0	$0	0.705	$0
7		$0	$0	$0	0.665	$0
8		$0	$0	$0	0.627	$0
9		$0	$0	$0	0.592	$0
10		$0	$7,375	$7,375	0.558	$4,118
11		$0	$0	$0	0.527	$0
12		$0	$0	$0	0.497	$0
13		$0	$0	$0	0.469	$0
14		$0	$0	$0	0.442	$0
15		$0	$7,375	$7,375	0.417	$3,077
16		$0	$0	$0	0.394	$0
17		$0	$0	$0	0.371	$0
18		$0	$0	$0	0.350	$0
19		$0	$0	$0	0.331	$0
20		$0	$7,375	$7,375	0.312	$2,300
21		$0	$0	$0	0.294	$0
22		$0	$0	$0	0.278	$0
23		$0	$0	$0	0.262	$0
24		$0	$0	$0	0.247	$0
25		$0	$7,375	$7,375	0.233	$1,718
26		$0	$0	$0	0.220	$0
27		$0	$0	$0	0.207	$0
28		$0	$0	$0	0.196	$0
29		$0	$0	$0	0.185	$0
30		$0	$7,375	$7,375	0.174	$1,284
					TOTAL PRESENT WORTH	**$18,008**

Table D8-1

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 2: LAND USE CONTROLS AND MONITORING
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost				Extended Cost				
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Corrective Measures Implementation Pla	40	hr			$33.79		$0	$0	$1,352	$0	$1,352
1.2 Project Scheduling and Procurement	8	hr			$33.79		$0	$0	$270	$0	$270
2 MOBILIZATION/DEMOBILIZATION (FOR NEW MONITORING WELLS)											
2 Equipment Mob/Demob	1	ea			$200.00	$250.00	$0	$0	$200	$250	$450
2 Mobilize/Demobilize Personnel (2-persons)	1	ea		$375.00	$300.00		$0	$375	$300	$0	$675
3 DECONTAMINATION											
3.1 Temporary Decon Pad	1	ls		$450.00	$400.00	$155.00	$0	$450	$400	$155	$1,005
3.2 Decon Water Disposal	5	drum	$125.00				$625	$0	$0	$0	$625
3.3 Decon Water Storage Drums	5	ea		$45.00			$0	$225	$0	$0	$225
3.4 PPE (2 p * 5 days * 2 Weeks)	2	n-day		$30.00			$0	$60	$0	$0	$60
3.5 Decontaminate Equipment (Pressure Washer)	1	ea			$134.45	$50.00	$0	$0	$134	$50	$184
4 NEW MONITORING WELLS - 3 wells - (upto 15 feet)											
4.1 Hollow Stem Auger	45	ft			$24.87		$0	$0	$1,119	$0	$1,119
4.2 2-inch PVC well casing	45	ft		$10.08			$0	$454	$0	$0	$454
4.3 Construction (2-man crew)	2	day	$456.80				$914	$0	$0	$0	$914
4.4 2-inch PVC well Screen	30	ft		$14.02			$0	$421	$0	$0	$421
5 Professional Services											
5.1 Drawings Prep. And Engineering Oversight	40	hr			$33.79		$0	$0	$1,352	$0	$1,352
6 LAND USE CONTROLS											
6.1 Construction (2-man crew)	1	day	$456.80				$457	$0	$0	$0	$457
6.2 Prepare Land Use Plan	100	hours			$33.79		$0	$0	$3,379	$0	$3,379
6.3 Modify Master Plan and Prepare Deed Restrictior	80	hours			$33.79		$0	$0	$2,703	$0	$2,703
Subtotal Direct Capital Costs less Subcontract								$1,984	$11,209	$455	$13,649
Local Area Adjustment								123%	88%	123%	
								$2,431	$9,853	$559	$12,843
Overhead on Labor Cost @ 30%									$2,956		$2,956
G & A on Labor Cost @ 10%									$985		$985
G & A on Material Cost @ 10%								$243			$243

Table D8-1

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 2: LAND USE CONTROLS AND MONITORING
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
Total Direct Capital Cost								$2,674	$13,794	$559	$17,027
Indirects on Total Direct Labor Cost @	75%								$10,346		$10,346
Profit on Total Direct Cost @	10%										$1,703
Subtotal											$29,075
Health & Safety Monitoring @	3%	(Includes Subcontractor cost)									$932
Health & Safety Training, Site-specific Training											$932
Total Field Cost											**$30,940**
Subtotal Subcontractor Cost							$1,995				$1,995
G & A on Subcontract Cost @	10%						$200				$200
Profit on Subcontractor Cost @	5%										$100
Subcontractor Cost											**$2,295**
ontingency on Total Field and Subcontractor Costs @	10%										**$3,323**
:ngineering on Total Field and Subcontractor Costs @	5%										**$1,662**
TOTAL Capital COST											**$38,220**

Assumptions: Three new monitoring wells will be installed. Periodic sampling will be performed with 6 monitoring wells and one peizometer well. Sampling will be on quaterterly basis for the years 1-5 and willl be on semi-annual basis for the rest of the period. The

Table D8-2

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 2: LAND USE CONTROLS AND MONITORING
Operation and Maintenance Costs per Year

	Item	Qty	Unit	Unit Cost	Subtotal Cost
1	Energy - Electric		kWh	$0.06	$0
2	Maintenance/Repair of Monitoring Wells	1	LS	$1,000.00	$1,000
3	Sampling of Wells	2	Qtr.	$1,950.00	$3,900
4	Analysis of GW samples-4 wells + 2QA/QC	12	ea	$1,167.97	$14,016
5	Semiannual Reports	2	ea	$4,000.00	$8,000
	Total Cost for One Year Operation (for years 1-5)				$26,916
	Total Cost for One Year Operation (for years 6-30, annual sampling) (1*maint. +1*sampling+6*analysis+1*report)				$13,958

Table D8-3

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 2: LAND USE CONTROLS AND MONITORING
ANNUAL COSTS

Cost Item	Quantity	Unit	Unit Cost[a]	Total Cost
1 FIVE YEAR SITE REVIEW				
1.1 Site Review Meeting (2-persons for 2-days)				
Project Manager	16	hr	$76.00	$1,216
Staff Engineer	16	hr	$52.04	$833
ODCs (travel, etc.)	1	ls	$800.00	$800
1.2 Review Report				
Project Manager	16	hr	$76.00	$1,216
Staff Engineer	32	hr	$52.04	$1,665
ODCs (photocopies, telephone, etc.)	1	ls	$100.00	$100
Subtotal Review Cost				$5,830
G&A and Profit @ 15%				$874
Subtotal				$6,704
Total for Review Cost				**$6,704**
2 LAND USE CONTROL MONITORING (FOR 30 YEAR PERIOD)				
2.1 Quarterly Site Inspections				
Project Manager (2 hrs for each Inspection)	8	hr	$76.00	$608
ODCs (travel, etc.)	1	ls	$1,000.00	$1,000
2.2 Annual Review and Report				
Project Manager	12	hr	$76.00	$912
Staff Engineer	12	hr	$52.04	$624
ODCs (photocopies, telephone, etc.)	1	ls	$100.00	$100
Subtotal Land Use Control Monitoring				$3,244
G&A and Profit @ 15%				$487
Subtotal				$3,731
Total Land Use Control Monitoring Cost				**$3,731**

[a] includes overhead on professional labor @ 100%.

Table D8-4

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 2: LAND USE CONTROLS AND MONITORING
PRESENT WORTH ANALYSIS

Year	Capital Cost	Operation and Maintenance Cost	Annual Cost	Total Yearly Cost	Present-Worth Factor (i = 7%)	Present Worth
0	$38,220			$38,220	1.000	$38,220
1		$26,916	$3,731	$30,647	0.935	$28,655
2		$26,916	$3,731	$30,647	0.873	$26,755
3		$26,916	$3,731	$30,647	0.816	$25,008
4		$26,916	$3,731	$30,647	0.763	$23,384
5		$26,916	$10,436	$37,351	0.713	$26,631
6		$13,958	$3,731	$17,689	0.666	$11,781
7		$13,958	$3,731	$17,689	0.623	$11,020
8		$13,958	$3,731	$17,689	0.582	$10,295
9		$13,958	$3,731	$17,689	0.544	$9,623
10		$13,958	$10,436	$24,393	0.508	$12,392
11		$13,958	$3,731	$17,689	0.475	$8,402
12		$13,958	$3,731	$17,689	0.444	$7,854
13		$13,958	$3,731	$17,689	0.415	$7,341
14		$13,958	$3,731	$17,689	0.388	$6,863
15		$13,958	$10,436	$24,393	0.362	$8,830
16		$13,958	$3,731	$17,689	0.339	$5,997
17		$13,958	$3,731	$17,689	0.317	$5,607
18		$13,958	$3,731	$17,689	0.296	$5,236
19		$13,958	$3,731	$17,689	0.277	$4,900
20		$13,958	$10,436	$24,393	0.258	$6,293
21		$13,958	$3,731	$17,689	0.242	$4,281
22		$13,958	$3,731	$17,689	0.226	$3,998
23		$13,958	$3,731	$17,689	0.211	$3,732
24		$13,958	$3,731	$17,689	0.197	$3,485
25		$13,958	$10,436	$24,393	0.184	$4,488
26		$13,958	$3,731	$17,689	0.172	$3,043
27		$13,958	$3,731	$17,689	0.161	$2,848
28		$13,958	$3,731	$17,689	0.150	$2,653
29		$13,958	$3,731	$17,689	0.141	$2,494
30		$13,958	$10,436	$24,393	0.131	$3,196
					TOTAL PRESENT WORTH	**$325,304**

Table D9-1

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 3: LUCs, EXTRACTION, EX SITU TREATMENT, SURFACE DISCHARGE, AND MONITORING
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Corrective Measures Implementation Plar	200	hr			$33.79		$0	$0	$6,758	$0	$6,758
1.2 Project Scheduling and Procurement	40	hr			$33.79		$0	$0	$1,352	$0	$1,352
2 MOBILIZATION/DEMOBILIZATION											
2 Equipment Mob/Demob	2	ea			$200.00	#######	$0	$0	$400	$5,000	$5,400
2 Mobilize/Demobilize Personnel (2-persons)	2	ea		$375.00	$300.00		$0	$750	$600	$0	$1,350
2.3 Portable Toilet	1	mo	$76.03				$76	$0	$0	$0	$76
2.4 Storage Trailer (28' x 10')	1	mo	$100.78				$101	$0	$0	$0	$101
3 DECONTAMINATION											
3.1 Temporary Decon Pad	1	ls		$450.00	$400.00	$155.00	$0	$450	$400	$155	$1,005
3.2 Decon Water Disposal	50	drum	$125.00				$6,250	$0	$0	$0	$6,250
3.3 Decon Water Storage Drums	50	ea		$45.00			$0	$2,250	$0	$0	$2,250
3.4 PPE (2 p * 5 days * 2 Weeks)	20	n-day		$30.00			$0	$600	$0	$0	$600
3.5 Decontaminate Equipment (Pressure Washer)	1	ea			$134.45	$50.00	$0	$0	$134	$50	$184
4 SITE PREPARATION											
4.1 Erosion Control Fencing	1000	lf		$0.23	$1.17		$0	$230	$1,170	$0	$1,400
4.2 Construction Surveys (2-man crew)	2	day	$648.36				$1,297	$0	$0	$0	$1,297
4.3 Utility Location and Site Delineation/Layout	24	hrs			$33.23		$0	$0	$798	$0	$798
5 EXTRACTION WELLS - 4-inch.- 3 wells (upto 25 feet)											
5.1 Hollow Stem Auger - 8-inch dia	75	ft	$24.87				$1,865	$0	$0	$0	$1,865
5.2 4-inch PVC well casing	75	ft	$15.97				$1,198	$0	$0	$0	$1,198
5.3 4-inch well screen	30	ft	$23.53				$706	$0	$0	$0	$706
5.4 4-inch well bentonite seal	3	ea	$95.96				$288	$0	$0	$0	$288
5.5 2-inch PVC piping	600	ft	$6.50				$3,900	$0	$0	$0	$3,900
5.6 2,000-gal double walled steel above ground tank	1	ea	$3,204.00				$3,204	$0	$0	$0	$3,204
5.7 2-inch PVC Tees	30	ea	$1.69				$51	$0	$0	$0	$51
5.8 Submersible Pumps - 2 nos.-15-20 gpm, 1/2hp w	3	unit	$1,466.00				$4,398	$0	$0	$0	$2,277
5.9 Health & Safety Monitoring	10	day			$376.32	$200.00	$0	$0	$3,763	$2,000	$5,763
6 GREENSAND FILTER SYSTEM											
6.1 20 gpm greensand filter with valves and controls	1	unit	########				$20,802	$0	$0	$0	$20,802
6.2 20 gpm 0.5 hp transfer pump with motor, valves, and piping (one standby)	2	unit	$1,546.00				$3,092	$0	$0	$0	$3,092
6.3 Process Trailer (10.25' x 5.5' x 8.33')	1	ea				#######	$0	$0	$0	$25,637	$25,637
6.4 Sludge handling	1	ls	########				$30,000	$0	$0	$0	$30,000
6.5 Installation cost	600	hrs			$33.79		$0	$0	$20,274	$0	$20,274
8 Professional Services											
8.1 Drawings Prep. and Engineering Oversight	300	hr			$33.79		$0	$0	$10,137	$0	$10,137
9 SITE RESTORATION											
9.1 Cleanup areas surrounding the wells	1	day			$227.20	$435.00	$0	$0	$227	$435	$662
9.2 Sod Disturbed Area	0.02	acre	########				$417	$0	$0	$0	$417
10 LAND USE CONTROLS											
### Site Survey (2-man crew)	3	days	$648.36				$1,945	$0	$0	$0	$1,945
### Prepare Land Use Plan	100	hours			$33.79		$0	$0	$3,379	$0	$3,379
### Modify Master Plan and Prepare Deed Restriction:	80	hours			$33.79		$0	$0	$2,703	$0	$2,703
11 NEW MONITORING WELLS - 3 wells (upto 15 feet)											
### Hollow Stem Auger	45	ft			$24.87		$0	$0	$1,119	$0	$1,119
### 2-inch PVC well casing	45	ft		$10.08			$0	$454	$0	$0	$454
### Construction (2-man crew)	2	day	$456.80				$914	$0	$0	$0	$914

Table D9-1

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 3: LUCs, EXTRACTION, EX SITU TREATMENT, SURFACE DISCHARGE, AND MONITORING
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
### 2-inch PVC well Screen	30	ft		$14.02			$0	$421	$0	$0	$421
Subtotal Direct Capital Costs less Subcontract								$5,154	$53,214	$33,277	$91,646
Local Area Adjustment								123%	88%	123%	
								$6,314	$46,775	$40,897	$93,987
Overhead on Labor Cost @ 30%									$14,033		$14,033
G & A on Labor Cost @ 10%									$4,678		$4,678
G & A on Material Cost @ 10%								$631			$631
Total Direct Capital Cost								$6,945	$65,486	$40,897	$113,328
Indirects on Total Direct Labor Cost @ 75%									$49,114		$49,114
Profit on Total Direct Cost @ 10%											$11,333
Subtotal											$173,775
Health & Safety Monitoring @ 3%			(Includes Subcontractor cost)								$7,628
Health & Safety Training, Site-specific Training											$7,628
Total Field Cost											$189,032
Subtotal Subcontractor Cost							$80,503				$80,503
G & A on Subcontract Cost @ 10%							$8,050				$8,050
Profit on Subcontractor Cost @ 5%											$4,025
Subcontractor Cost											**$92,578**
Contingency on Total Field and Subcontractor Costs @ 10%											**$28,161**
Engineering on Total Field and Subcontractor Costs @ 5%											**$14,081**
TOTAL Capital COST											**$323,852**

new monitoring wells would be installed. The extracted water would be treated in the green sand filteration system and then finally discharged to a POTW. A total of 7 monitoring wells would be monitored.

Table D9-2

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 3: LUCs, EXTRACTION, EX SITU TREATMENT, SURFACE DISCHARGE, AND MONITORING
Operation and Maintenance Costs per Year

	Item	Qty	Unit	Unit Cost	Subtotal Cost
1	Energy - Electric	30,000	kWh	$0.06	$1,800
2	Maintenance/Repair of Extraction/Monitoring Wells, Pumps	4	LS	$1,000.00	$4,000
3	Labor, Mobilization/Demobilization, Per Diem, Supplies	1	wk	$925.00	$925
4	Sampling of Wells	4	Qtr.	$1,950.00	$7,800
5	Analysis of GW samples-7 wells +2QA/QC	36	ea	$1,167.97	$42,047
6	Discharge of treated water to POTW	7387.5	Kgallons	$1.54	$11,377
7	Quarterly Reports	4	ea	$4,000.00	$16,000
	Total Cost for One Year Operation (for years 1-8)				$83,949
	Total Cost for One Year Operation (for years 9-30, semi-annual sampling) (2*maint. +2*sampling+18*analysis+2*reports)				$34,923

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Table D9-3

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 3: LUCs, EXTRACTION, EX SITU TREATMENT, SURFACE DISCHARGE, AND MONITORING
ANNUAL COSTS

Cost Item	Quantity	Unit	Unit Cost[a]	Total Cost
1 FIVE YEAR SITE REVIEW				
1.1 Site Review Meeting (2-persons for 2-days)				
Project Manager	16	hr	$76.00	$1,216
Staff Engineer	16	hr	$52.04	$833
ODCs (travel, etc.)	1	ls	$800.00	$800
1.2 Review Report				
Project Manager	16	hr	$76.00	$1,216
Staff Engineer	32	hr	$52.04	$1,665
ODCs (photocopies, telephone, etc.)	1	ls	$100.00	$100
Subtotal Review Cost				$5,830
G&A and Profit @ 15%				$874
Subtotal				$6,704
Total for Review Cost				**$6,704**
2 LAND USE CONTROL MONITORING (FOR 30 YEAR PERIOD)				
2.1 Quarterly Site Inspections				
Project Manager (2 hrs for each Inspection)	8	hr	$76.00	$608
ODCs (travel, etc.)	1	ls	$1,000.00	$1,000
2.2 Annual Review and Report				
Project Manager	12	hr	$76.00	$912
Staff Engineer	12	hr	$52.04	$624
ODCs (photocopies, telephone, etc.)	1	ls	$100.00	$100
Subtotal Land Use Control Monitoring				$3,244
G&A and Profit @ 15%				$487
Subtotal				$3,731
Total Land Use Control Monitoring Cost				**$3,731**

[a] Includes Overhead on professional labor @ 100%.

Table D9-4

U.S. Naval Station (NAVSTA), Mayport
Mayport, FLORIDA
SWMU 17
GROUNDWATER ALTERNATIVE 3: LUCs, EXTRACTION, EX SITU TREATMENT, SURFACE DISCHARGE, AND MONITORING
PRESENT WORTH ANALYSIS

Year	Capital Cost	Operation and Maintenance Cost	Annual Cost	Total Yearly Cost	Present-Worth Factor (i = 7%)	Present Worth
0	$323,852			$323,852	1.000	$323,852
1		$83,949	$3,731	$87,680	0.935	$81,981
2		$83,949	$3,731	$87,680	0.873	$76,544
3		$83,949	$3,731	$87,680	0.816	$71,547
4		$83,949	$3,731	$87,680	0.763	$66,900
5		$83,949	$10,436	$94,384	0.713	$67,296
6		$83,949	$3,731	$87,680	0.666	$58,395
7		$83,949	$3,731	$87,680	0.623	$54,625
8		$83,949	$3,731	$87,680	0.582	$51,030
9		$34,923	$3,731	$38,655	0.544	$21,028
10		$34,923	$10,436	$45,359	0.508	$23,042
11		$34,923	$3,731	$38,655	0.475	$18,361
12		$34,923	$3,731	$38,655	0.444	$17,163
13		$34,923	$3,731	$38,655	0.415	$16,042
14		$34,923	$3,731	$38,655	0.388	$14,998
15		$34,923	$10,436	$45,359	0.362	$16,420
16		$34,923	$3,731	$38,655	0.339	$13,104
17		$34,923	$3,731	$38,655	0.317	$12,254
18		$34,923	$3,731	$38,655	0.296	$11,442
19		$34,923	$3,731	$38,655	0.277	$10,707
20		$34,923	$10,436	$45,359	0.258	$11,703
21		$34,923	$3,731	$38,655	0.242	$9,354
22		$34,923	$3,731	$38,655	0.226	$8,736
23		$34,923	$3,731	$38,655	0.211	$8,156
24		$34,923	$3,731	$38,655	0.197	$7,615
25		$34,923	$10,436	$45,359	0.184	$8,346
26		$34,923	$3,731	$38,655	0.172	$6,649
27		$34,923	$3,731	$38,655	0.161	$6,223
28		$34,923	$3,731	$38,655	0.150	$5,798
29		$34,923	$3,731	$38,655	0.141	$5,450
30		$34,923	$10,436	$45,359	0.131	$5,942

TOTAL PRESENT WORTH **$1,110,701**

APPENDIX E

DESIGN CALCULATIONS

SWMU 12

NEUTRALIZATION BASIN

APPENDIX E1

APPENDIX E1-1

GROUNDWATER EXTRACTION CALCULATIONS

CLIENT: NAVSTA Mayport		JOB NUMBER: N0455	
SUBJECT: Design Extraction Well System for Groundwater Plume Capture, SWMU No. 12			
BASED ON: RFI data, EPA WHPA Model		DRAWING NO.:	
BY: A. Jenkins	CHECKED BY:	APPROVED BY:	DATE: March 13, 2001

PPROBLEM:

Design a system of groundwater extraction wells with a capture zone sufficient to mitigate the groundwater plume area at SWMU No. 12.

ASSUMPTIONS:

Each of three monitoring wells at SWMU No. 12 contains one or more COCs that exceed the MCS for groundwater. Because of the spacing and position of these wells (see Figure 2-3 and Appendix C) it is necessary to assume that the groundwater plume extends across the width and length of the area defined in the RFI as SWMU No. 12, or an area approximately 240 feet wide (east-west) by 200 feet long (north-south).

Because the estimated mixing depth of the contaminant plume at SWMU No. 12 does not affect the entire thickness of the Surficial Aquifer (see Appendix), the proposed maximum depth of the extraction wells is 20 feet in to the shallow zone of the Surficial Aquifer. Although the following model simulations are based on a Surficial Aquifer thickness of 60 feet, it is assumed that 20 feet depth of penetration for the extraction wells will be sufficient to avoid total dewatering of the wells due to partial penetration affects when they are pumped at the design extraction rate.

DATA:

Data presented in the GIR and RFI reports were used to select aquifer parameters required to model the effects of groundwater extraction wells on the Surficial Aquifer. The model inputs are listed on the "Groundwater Flow Model Inputs" sheet following this calculation sheet. Prior to modeling, the "maximum gravity drainage for a fully penetrating well" in the surficial aquifer was estimated to limit the proposed pumping rate to be modeled (see following sheet). This calculation indicated that the upper limit of pumping would be about 4.7 gpm per well (for noninterfering wells). In addition, the "radius of influence" (required for estimating the maximum gravity drainage) for pumping conducted in the Surficial Aquifer was estimated using an analytical solution (see following sheet).

The initial elevation of the water table in the vicinity of the proposed extraction wells RW-1and RW-2 was set at 2 ft AMSL based on measurements presented for existing well MPT-11-MW02S in the RFI.

MODEL:

The Multiple Well Capture Zone Module (MWCAP) computational code provided in the US EPA WHAP, "A Modular Semi-Analytical Model for the Delineation of Wellhead Protection Areas", Office of Ground Water, March 1991, was used to simulate the capture zone for groundwater extraction wells proposed in Alternative No. 4. The MWCAP code delineates steady-state, time-related or hybrid capture zones for pumping wells in homogeneous aquifer with steady and uniform ambient ground-water flow. The code can simulate the effects of a nearby stream (e.g., St. Johns River) where groundwater is discharging. However, the effects of well interference in multi-well systems are ignored and each well is assumed to operate independently of each other. The two major assumptions for the MWCAP code are 1) flow in the aquifer is at steady state, and 2) flow in the aquifer is horizontal. For the problem at SWMU No. 12, both of these assumptions are reasonable. And, if the well spacing avoids aggressive overlapping of each well's capture zone, then little error should be introduced by the model's assumption of independent extraction wells.

RESLUTS:

Professional judgement, trial and error, and the model simulations were used to determine the final scenario of two extraction wells at SWMU No. 12. The goal was to balance the number of wells with the pumping rate required to capture the plume. Because the plume does not mix with the entire aquifer thickness it was desired to limit the extraction well depth and limit drawdown, which requires multiple wells to obtain the desired capture zone.

Several combinations of pumping rate and number of extraction wells were simulated. The MWCAP model was run for two time periods, one and three years, to simulate the change in the capture zone over time. The model simulations for 3 years were then overlaid to present the capture zone shown in the following figure. As shown in the figure, an extraction rate of 3 gpm at each of three extraction wells is sufficient to capture the groundwater flowing beneath SMWU No. 12 (i.e., as indicated by overlapping capture zones). The simulation indicates that a pumping period of about 2.5 years is required to capture the plume area.

As shown in the figure, the water table contours for the pumping condition indicate that drawdown in the vicinity of the extraction wells is than about 1 foot (drawdown in the wells is not provided by the model; however, the "maximum gravity drainage" sheet following shows that maximum drawdown for pumping at 3 gpm would be about 2.5 ft). Significant interference by induced flow from the St. Johns River is not indicated by the model simulation.

CONCLUSIONS:

A pumping rate of 3 gpm for each of two recovery wells located across the northern perimeter of SMWU No. 12 should be sufficient to capture a potential groundwater plume that underlies all of the site. The capture zones of each well will begin to overlap after about three years of pumping, assuming no significant recharge, and well interference may increase the capture zone. In addition, no affects from the St. Johns River are anticipated.

The simulated capture zone indicates that all of the water (i.e., one pore volume) beneath the contaminated area of SWMU No. 12 can be extracted within approximately 2.5 years of pumping. Recovery wells that penetrate only the upper 20 ft of the Surficial Aquifer are recommended to focus the extraction from the shallow portion of the aquifer. A pilot pump test should be performed at SWMU No. 12 to validate the aquifer parameters used in the modeling and to support the final extraction well design.

GROUNDWATER FLOW MODEL INPUTS
SWMU No. 12 - Two Recovery Wells Scenario

Model Used: EPA WHPA - MWCAP (EPA , Office of Groundwater, Version 2.0, March 1991.

UNITS USED FOR SIMULATION = 1
- 0 = METERS AND DAYS
- 1 = FEET AND DAYS

COORDINATE LIMITS OF STUDY AREA = 600 by 600 foot area surrounding SWMU No. 12

XMIN =	-300.00
XMAX =	300.00
YMIN =	-300.00
YMAX =	300.00

MAXIMUM STEP LENGTH = 10.00

NUMBER OF WELLS = 2

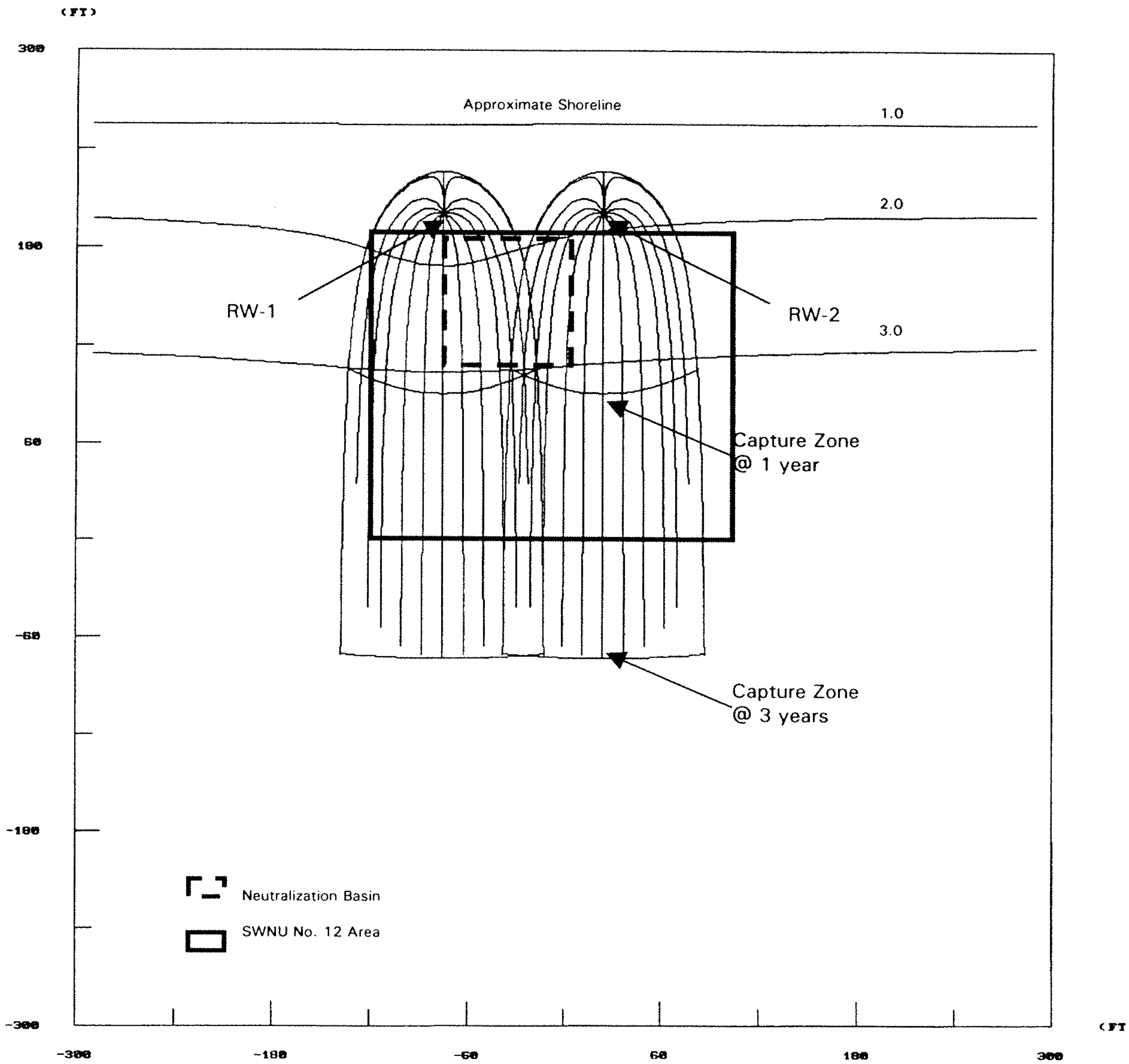
WELL NUMBER 1 = RW-2

X COORDINATE =	-75.0	25 feet east of MPT-11-MW029
Y COORDINATE =	200.0	
WELL DISCHARGE =	577.0 =	3 gallon per minute
TRANSMISSIVITY =	360.0 =	Kb = (6 ft/day)(60 ft)
HYDRAULIC GRADIENT =	0.012500 =	based on RFI data
ANGLE OF AMBIENT FLOW =	90.00 =	flow to north
AQUIFER POROSITY =	0.35 =	based on RFI data
AQUIFER THICKNESS =	60.00 =	based on RFI data
BOUNDARY TYPE =	STREAM BOUNDARY =	St. Johns River
DISTANCE FROM WELL TO BOUNDARY =	60.00 =	distance to river
ORIENTATION OF LOCAL COORDINATE SYSTEM =	270.00 =	east-west shoreline
SELECTED CAPTURE ZONE OPTION =	HYBRID =	capture zone @ 1 and 3 yrs.
TRAVEL TIME VALUE =	1095.00	3 years of pumping
NUMBER OF PATHLINES =	10 =	particles tracked

WELL NUMBER 2 = RW-1

X COORDINATE =	25.0	100 feet west of RW-2
Y COORDINATE =	200.0	
WELL DISCHARGE =	577.0	(same as for RW-1)
TRANSMISSIVITY =	360.0	
HYDRAULIC GRADIENT =	0.012500	
ANGLE OF AMBIENT FLOW =	90.00	
AQUIFER POROSITY =	0.35	
AQUIFER THICKNESS =	60.00	
BOUNDARY TYPE =	STREAM BOUNDARY	
DISTANCE FROM WELL TO BOUNDARY =	60.00	
ORIENTATION OF LOCAL COORDINATE SYSTEM =	270.00	
SELECTED CAPTURE ZONE OPTION =	HYBRID	
TRAVEL TIME VALUE =	1095.00	
NUMBER OF PATHLINES =	10	

SWMU NO. 12 - GROUNDWATER ALTERNATIVE 3
EXTRACTION WELL CAPTURE ZONE
NAVSTA MAYPORT - MAYPORT, FLORIDA



- Two extraction wells located along northern perimeter of former neutralization basin.
- RW-1 located 75 west of MPT-11-MW02S; RW-2 located 25 feet east.
- Pumping rate of 3 gallons per minute per well.
- Steady-state capture zones at 1 year and 3 years shown.
- Water table contour elevations shown in feet AMSL.
- Downgradient extent of capture zone is approximate shoreline of St. Johns River.

SOLUTION FOR MAXIMUM DRAWDOWN (S max.) IN A FULLY PENETRATING PUMPING WELL AT MAXIMUM DISCHARGE
(from M.J. Gefell, et al, GROUNDWATER, MAY-JUNE, 1994)

S max. = $\{-b+/-[b^2-4ac]^{0.5}\}/2a$

a = [1/ln(R/r)] where S max. = maximum water-table drawdown, ft
R = estimated radius of influence, ft

b = -2{r+[H/ln(R/r)]} r = well effective radius, or radius of borehole w/ filter pack, ft

c = 2rH H = aquifer saturated thickness, ft
K = horizontal hydraulic conductivity, ft/day

NAVSTA Mayport - SWMU No. 12			
r =	0.42		
H =	60		
Case:	**1**	**2**	**3**
K =	0.2	6	32
R =	40	217	500
a =	0.219	0.160	0.141
b =	-27.177	-20.048	-17.784
c =	50.4	50.4	50.4
S max. =	**1.88**	**2.57**	**2.90**

(KOZENY, 1953) SOLUTION FOR MAXIMUM GRAVITY DRAINAGE INTO A FULLY PENETRATING PUMPING WELL AT MAXIMUM DRAWDOWN
(from M.J. Gefell, et al, GROUNDWATER, MAY-JUNE, 1994)

Q max. = AKi = 2(3.14)rhK

Q max. = maximum pumping rate at total drawdown in well, gpm
A = surface area of seepage face into well, ft^2
K =aquifer hydraulic conductivity, ft/day
i = 1, unit hydraulic gradient with steady state gravity drainage
r = well effective radius, or radius of borehole w/ filter pack, ft
h = saturated thickness at well, or height of seepage face into well, ft
h = H - S max., ft **(see calculation above for S max.)**

NAVSTA Mayport - SWMU No. 12						
Case:	1		2		3	
K =	0.2		6		32	
r =	0.42					
for h,	**h, feet**	**Q, gpm**	**h, feet**	**Q, gpm**	**h, feet**	**Q, gpm**
Q =	**58.12**	**0.16**	**57.43**	**4.72**	**57.10**	**25.03**

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT NAVY NAVSTA MAYPORT	JOB NUMBER N0455
SUBJECT Estimate Radius of Influence for Recovery Well at SWMU 12	
BASED ON	DRAWING NUMBER

BY A. Jenkins	CHECKED BY	APPROVED BY	DATE Mar. 9, 2001

Problem: Estimate Radius of Influence, R_o, for a well pumping from the shallow zone of the Surficial Aquifer

Given: Equation to estimate the order of magnitude of R_o (Powers, 1991)

$$R_o = r_w + \sqrt{\frac{Tt}{C_s}}$$

where r_w = well radius, ft
T = aquifer transmissivity $= Kb$
K = hydraulic conductivity
b = saturated thickness
t = time of pumping, days
C_s = aquifer specific yi[illegible]

Data:

K = 6 ft/day, average for aquifer in Group II SWMUs area, range is 0.2 to 32 ft/day
b = approximately 60 ft for the Surficial Aquifer; 70 ft depth to top of Hawthorn minus 10 ft depth to water table at SWMU No. 12
C_s = 0.23, assume 2/3 of total pore volume ($n = 0.35$ in GIR) will drain
r_w = assume 6 inch well in 10 inch borehole with filter pack
t = assume recovery well reaches steady state in 30 days

Calculation:

$$R_o = 0.42\,ft + \sqrt{\frac{(6\,f/d)(60\,f)(30\,d)}{0.23}}$$

$$R_o = 217\ ft$$

for $K = 0.2\ f/d$, $R_o = 40\ ft$
for $K = 32\ f/d$, $R_o = 500\ ft$

Ref: Powers, J.P., 1981, Construction Dewatering, John Wiley & Sons.

APPENDIX E1-2

BIOSCREEN MODEL

Appendix D

Problem: Estimate the time to attain the media cleanup standard for phenol in groundwater at SWMU 12 fusing BIOSCREEN Natural Attenuation Decision Support System.

The time frame to achieve media cleanup standards (MCS) was modeled using the BIOSCREEN Natural Attenuation Decision Support System model. BIOSCREEN is a screening model which simulates groundwater remediation through natural attenuation of dissolved hydrocarbons. The model, which is based on the Domenico analytical solute transport model, simulates advection, dispersion, and adsorption, in addition to the aerobic and anaerobic reactions. BIOSCREEN is a very flexible model in that it allows the use of separate decay coefficients for solute (groundwater phase) and the source. It can also estimate dispersion parameters from the plume length. The BIOSCREEN model was developed for the Air Force Center for Environmental Excellence (AFCEE) Technology Transfer Division at Brooks Air force Base by Groundwater Services, Inc., Houston, TX.

The model can be used to predict how far the dissolved contaminant plume will extend if no engineering controls or further source zone reduction measures are implemented. Furthermore, the model can be used to predict the duration the plume would persist until natural attenuation processes would cause it to dissipate (source zone concentration versus time).

BIOSCREEN includes three different model types.

1. Solute transport without decay
2. Solute transport with biodegradation modeled as a first-order decay process.
3. Solute transport with biodegradation modeled as an "instantaneous" biodegradation reaction.

<u>Input parameters</u>

The site-specific data were compiled and used as input to BIOSCREEN. If the site-specific data were not available, the literature values were used in the model.

Solute half life

The minimum and maximum solute half-life of phenol according to Handbook of Environmental Degradation Rates, Howard et. el. 1991 is 0.5 days and 7 days, respectively. The half life of 7 days (0.019 years) was selected in the model to be conservative.

Source thickness in saturated zone

The source thickness in the saturated zone was assumed to be the mixing depth of the groundwater (4.3 ft) calculated in Appendix B.

Estimation of soluble mass

Soluble mass = maximum concentration detected at site x contaminated volume

= 0.043 mg/L x 140,000 gallons

= 0.043mg/L x 140, 000 gallons, 1 kg/1000g x 1 g/1000 mg x 3.785 L/1 gallon

Soluble mass = 0.0227 Kg

The input parameters along with the source information are presented in the Table below.

Bioscreen Input Parameters

Parameter	Phenol	Source
Hydrogeology		
Hydraulic Conductivity (K)	2.1E-3 cm/sec	RFI
Hydraulic gradient (i)	0.0125 ft/ft	RFI
Effective Porosity (n)	0.35	RFI
Seepage velocity (Vs)	Calculated by model	Calculated by model
Dispersion		
Longitudinal Dispersivity (alpha x)	Calculated by model	Calculated by model
Transverse Dispersivity (alpha y)	Calculated by model	Calculated by model
Vertical Dispersivity (alpha z)	Calculated by model	Calculated by model
Estimated Plume Length (Lp)	120 ft	CMS Appendix C
Adsorption		
Soil Bulk Density (rho)	1.7 kg/L	
Partition Coefficient (K_{oc})	28.5 L/kg	Florida 62-777, Table 4, Technical Report
Fraction Organic Carbon (f_{oc})	1.1E-3	RFI
Retardation factor (R)	Calculated by model	Calculated by model
Biodegradation		
Solute Half Life (t-half)	0.019 years	Handbook of Environmental Degradation Rates, Howard et. el. 1991
1^{st} Order Decay Coefficient	Calculated by model	Calculated by model
Instantaneous reaction Model		
Delta Oxygen	Not Measured	
Delta Nitrate	0.06 mg/L	RFI
Observed Ferrous Iron	62.9 mg/L	RFI
Delta Sulfate	Not Used	
Observed Methane	Not Measured	
General		
Modeled Area Length	120 ft	CMS Appendix C
Modeled Area Width	65 ft	CMS Appendix C
Simulation Time	8 ft	Assumed
Source Data		
Source Thickness in Saturated Zone	4.3 ft	CMS Appendix B, Mixing Depth
Soluble Mass	0.0227 kg	Max Conc = 0.043 mg/L, Contaminated volume 140,000 gallons.

Output Results

The model was simulated using the first order decay model only. The instantaneous reaction model was not run because of insufficient information available to run the model.

In the first-order decay model, separate decay functions are used for the source and the solute phase. In the first-order decay model, the source half-life rate is much higher than the groundwater phase and as a result produces a concave or log-linear decay. The first-order decay model predicts that the concentration of phenol in the source zone would be reduced to 0.006 mg/L in approximately 8 years. The media cleanup standard for phenol in groundwater was determined to be 0.0065 mg/L.

A copy of the BIOSREEN input and output runs are included in Appendix E.

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence — Version 1.4

NAVSTA Mayport
SWMU 12
Run Name

Data Input Instructions:

115 ↑ or 0.02	1. Enter value directly....or 2. Calculate by filling in grey cells below. (To restore formulas, hit button below)
Variable*	Data used directly in model.
20	Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	77.6	(ft/yr)
or		↑ or	
Hydraulic Conductivity	K	2.1E-03	(cm/sec)
Hydraulic Gradient	i	0.0125	(ft/ft)
Porosity	n	0.35	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	8.0	(ft)
Transverse Dispersivity*	alpha y	0.8	(ft)
Vertical Dispersivity*	alpha z	0.0	(ft)
or		↑ or	
Estimated Plume Length	Lp	120	(ft)

3. ADSORPTION

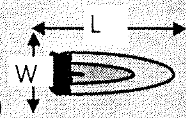
Retardation Factor*	R	1.2	(-)
or		↑ or	
Soil Bulk Density	rho	1.7	(kg/l)
Partition Coefficient	Koc	28.5	(L/kg)
FractionOrganicCarbon	foc	1.1E-3	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	3.6E+1	(per yr)
or		↑ or	
Solute Half-Life	t-half	0.019	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO		(mg/L)
Delta Nitrate*	NO3		(mg/L)
Observed Ferrous Iron*	Fe2+		(mg/L)
Delta Sulfate*	SO4		(mg/L)
Observed Methane*	CH4		(mg/L)

5. GENERAL

Modeled Area Length*	120	(ft)
Modeled Area Width*	65	(ft)
Simulation Time*	8	(yr)



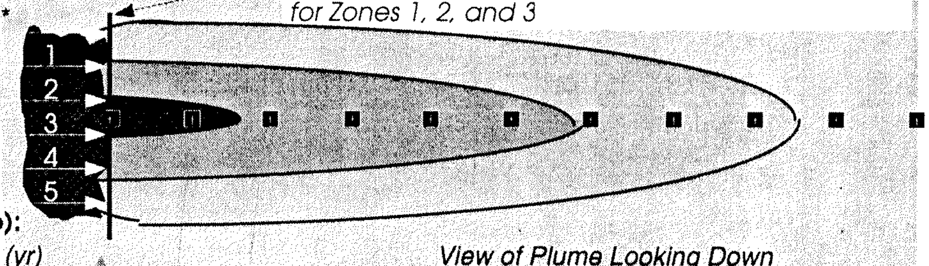
6. SOURCE DATA

Source Thickness in Sat.Zone* 4.3 (ft)

Source Zones:

Width* (ft)	Conc. (mg/L)*
5	0.0065
15	0.02
25	0.043
15	0.02
5	0.0065

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Source Halflife (see Help):

3	3	(yr)
Inst. React.	1st Order	

Soluble Mass 0.02 (Kg)
In Source NAPL, Soil

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)	.043										
Dist. from Source (ft)	0	12	24	36	48	60	72	84	96	108	120

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

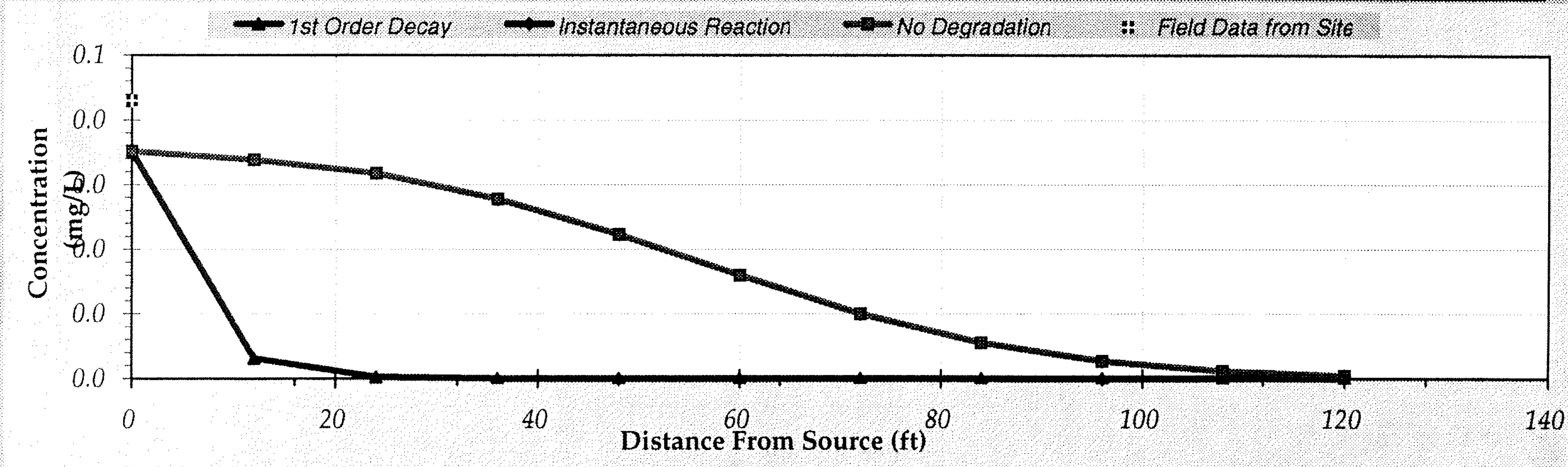
Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	12	24	36	48	60	72	84	96	108	120
No Degradation	0.035	0.034	0.032	0.028	0.022	0.016	0.010	0.006	0.003	0.001	0.000
1st Order Decay	0.035	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.035	0.034	0.032	0.028	0.022	0.016	0.010	0.006	0.003	0.001	0.000
Field Data from Site	0.043										



Replay Animation

Next Timestep

Prev Timestep

Time:

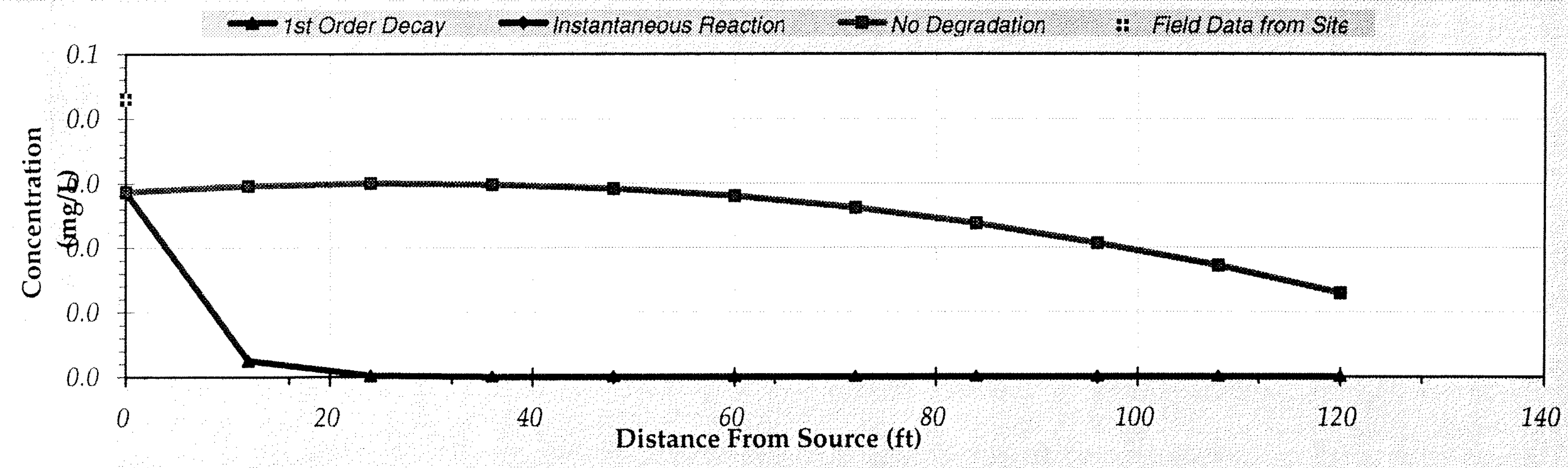
1 Years

Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	12	24	36	48	60	72	84	96	108	120
No Degradation	0.029	0.030	0.030	0.030	0.029	0.028	0.026	0.024	0.021	0.017	0.013
1st Order Decay	0.029	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.029	0.030	0.030	0.030	0.029	0.028	0.026	0.024	0.021	0.017	0.013
Field Data from Site	0.043										



Replay Animation

Next Timestep

Prev Timestep

Time:

2 Years

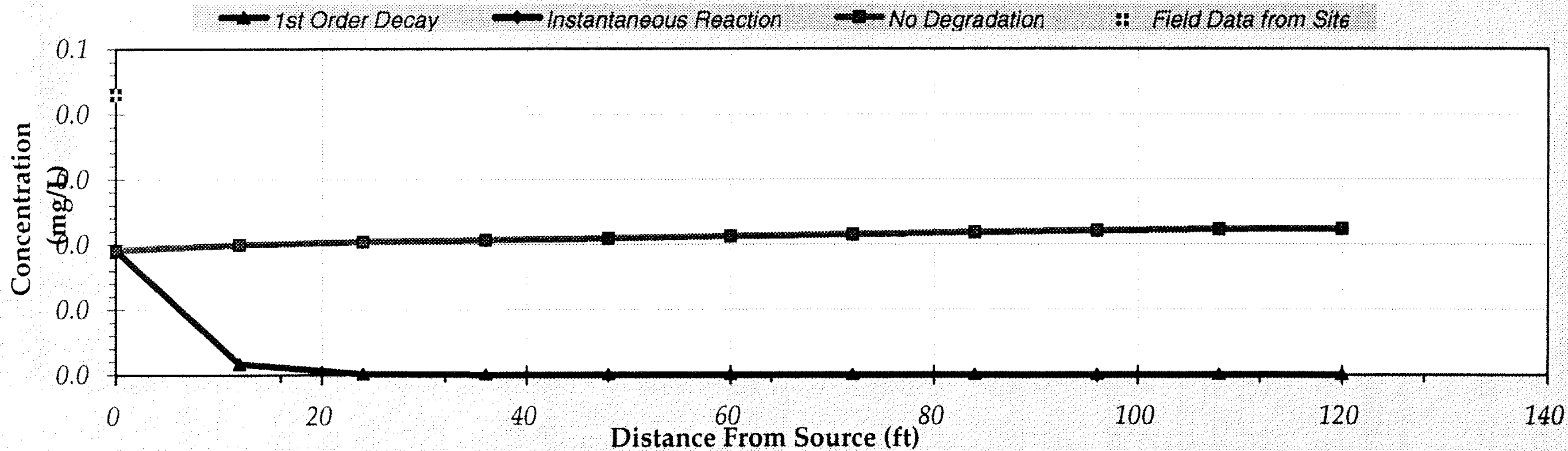
Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	12	24	36	48	60	72	84	96	108	120
No Degradation	0.019	0.020	0.020	0.021	0.021	0.021	0.022	0.022	0.022	0.022	0.022
1st Order Decay	0.019	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.019	0.020	0.020	0.021	0.021	0.021	0.022	0.022	0.022	0.022	0.022
Field Data from Site	0.043										



Replay Animation

Next Timestep

Prev Timestep

Time:

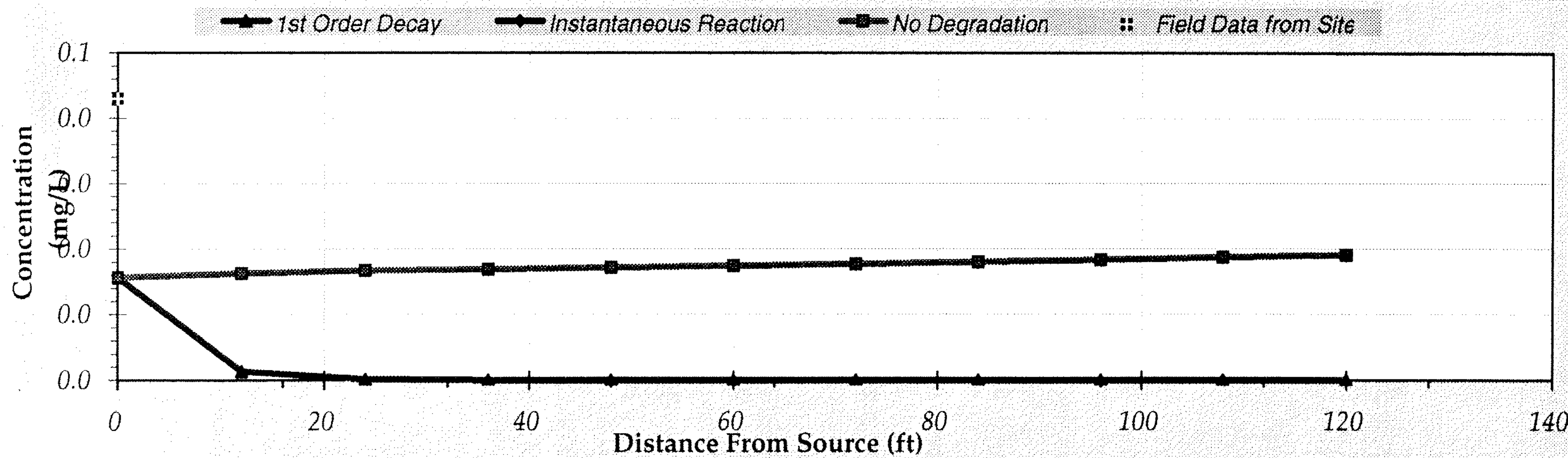
3 Years

Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft) 0	12	24	36	48	60	72	84	96	108	120
No Degradation	0.016	0.016	0.017	0.017	0.017	0.017	0.018	0.018	0.018	0.019	0.019
1st Order Decay	0.016	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.016	0.016	0.017	0.017	0.017	0.017	0.018	0.018	0.018	0.019	0.019
Field Data from Site	0.043										



Replay Animation

Next Timestep

Prev Timestep

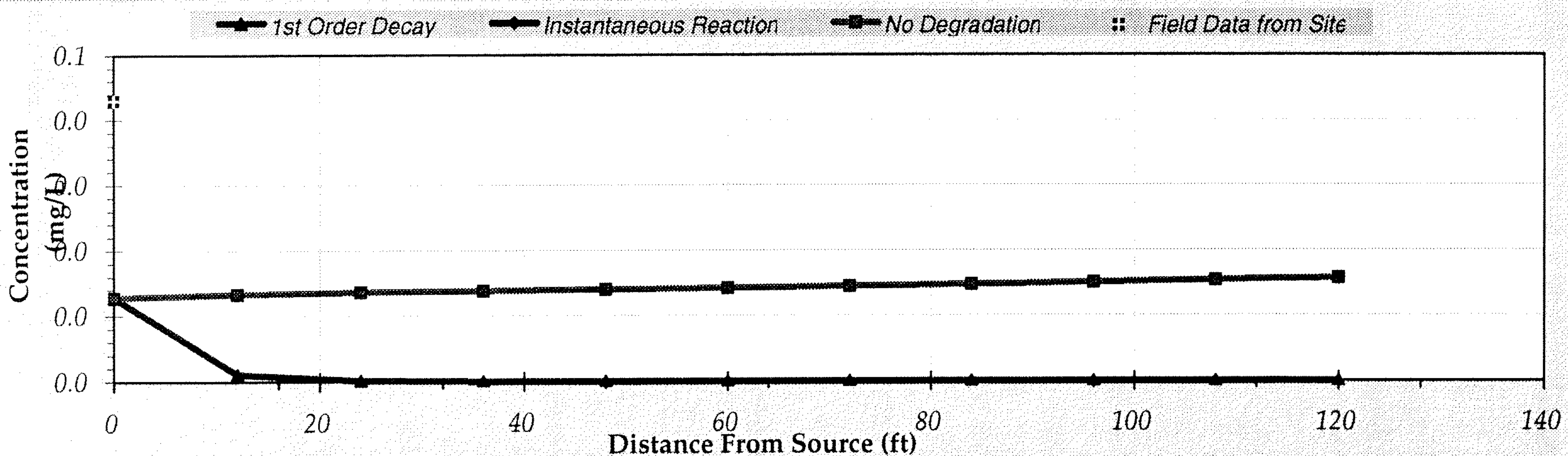
Time: 4 Years

Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	12	24	36	48	60	72	84	96	108	120
No Degradation	0.013	0.013	0.014	0.014	0.014	0.014	0.014	0.015	0.015	0.015	0.016
1st Order Decay	0.013	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.013	0.013	0.014	0.014	0.014	0.014	0.014	0.015	0.015	0.015	0.016
Field Data from Site	0.043										



Replay Animation

Next Timestep

Prev Timestep

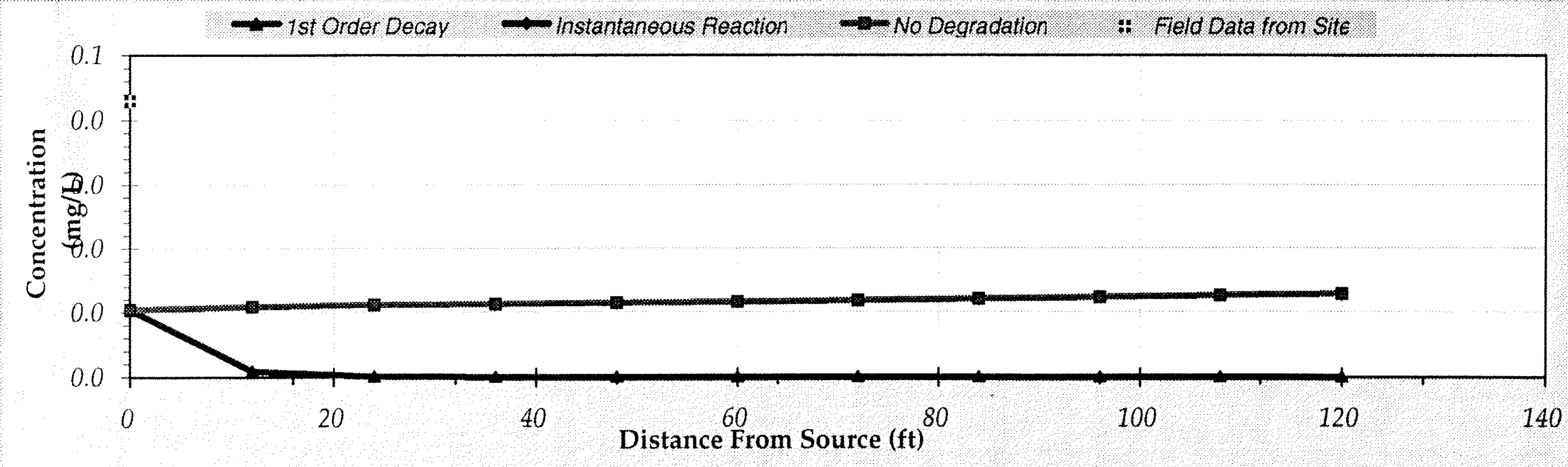
Time:
5 Years

Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	*Distance from Source (ft)* 0	12	24	36	48	60	72	84	96	108	120
No Degradation	0.010	0.011	0.011	0.011	0.011	0.012	0.012	0.012	0.012	0.013	0.013
1st Order Decay	0.010	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.010	0.011	0.011	0.011	0.011	0.012	0.012	0.012	0.012	0.013	0.013
Field Data from Site	0.043										



Replay Animation

Next Timestep

Prev Timestep

Time:

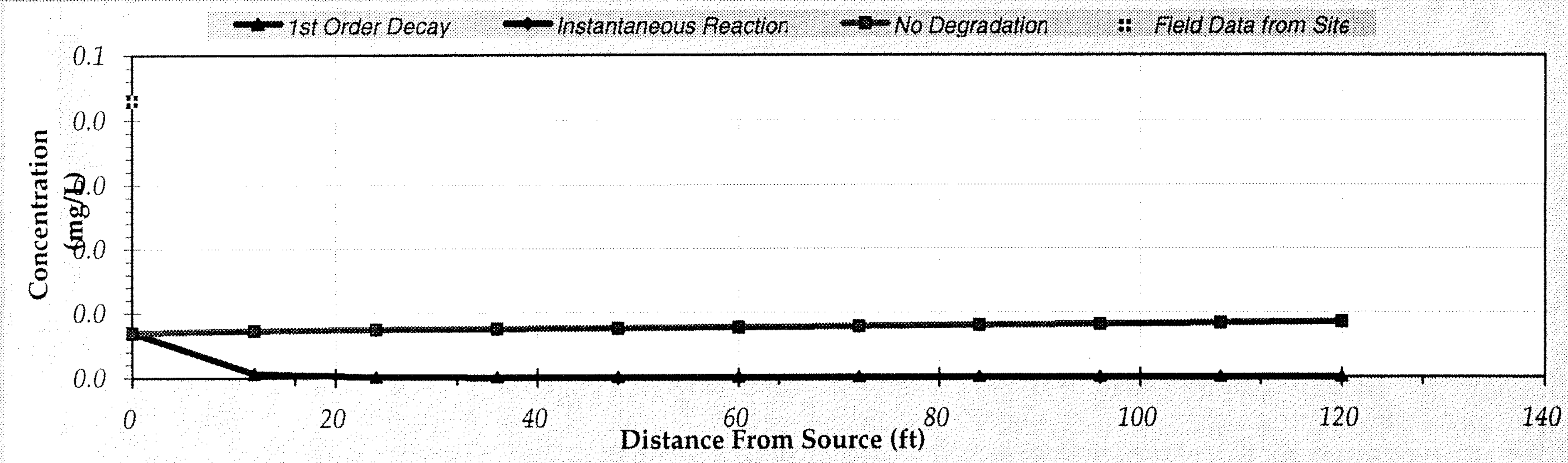
6 Years

Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	12	24	36	48	60	72	84	96	108	120
No Degradation	0.007	0.007	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.009
1st Order Decay	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.007	0.007	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.009
Field Data from Site	0.043										



Replay Animation

Next Timestep

Prev Timestep

Time:

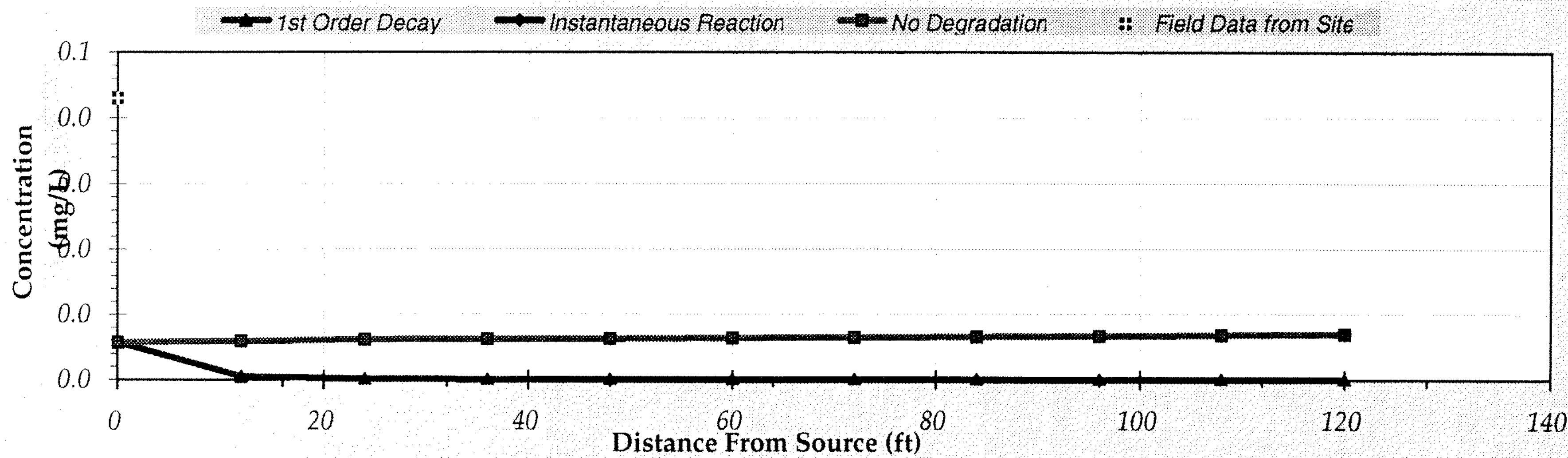
7 Years

Return to Input

Recalculate This Sheet

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	12	24	36	48	60	72	84	96	108	120
No Degradation	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.007
1st Order Decay	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.007
Field Data from Site	0.043										



Replay Animation

Next Timestep

Prev Timestep

Time: *8 Years*

Return to Input

Recalculate This Sheet

APPENDIX E1-3

ALTERNATIVE 3
DESIGN CALCULATIONS

CLIENT Mayport, FL	JOB NUMBER
SUBJECT Alternative 3. SWMU 12 Air Sparging	
BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE

The injection air flow rate to each well is assumed to be 5 ft^3/min

Assuming the radius of influence of is ft, 14 air sparging wells will be installed.

Air Injection Pressure of air sparging

Height of water column above the air injection point is 10 ft

Assume aquifer matrix consists of mainly fine sand

$$P_{hydrostatic} = \rho g h_{hydrostatic}$$

$$= \left(62.4 \frac{lb_m}{ft^3}\right)\left(32.2 \frac{ft}{s^2}\right)(10\ ft)\left[\frac{lb_f}{32.2 lb_m\text{-}ft}\right]$$

$$= 624 \frac{lb_f}{ft^2} = 4.33 \frac{lb_f}{in^2} = 4.33\ psi$$

Pore radius of fine sand media is 0.05 cm

height of capillary rise, h_c

$$h_c = \frac{0.153}{r} = \frac{0.153}{0.05} = 3.06\ cm = 0.1\ ft$$

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

$P_{capillary} = \rho g h_{capillary}$

water column height of 33.9 ft at 60°F is equivalent to one atm pressure or 14.7 psi

$$P_{capillary} = \left(\frac{0.1\ ft}{33.9\ ft}\right)(14.7\ psi) = 0.04\ psi$$

$$P_{injection} = P_{hydrostatic} + P_{capillary}$$
$$= 4.33 + 0.04 = 4.37\ psig$$

<u>Power requirement for air injection</u>

The air flow rate to each well is $5\ ft^3/min$

Assume head loss of the piping system and the injection head = 1 psi

Air injection pressure = 4.37 psig

Assuming isothermal expansion,

$$hp_{theoretical} = 3.03 \times 10^{-5}\ P_1 Q_1 \ln \frac{P_2}{P_1}$$

P_1 = initial pressure lb/ft^2

P_2 = final delivery pressure lb/ft^2

Q_1 = air flow rate at the intake condition ft^3/min

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

$P_1 = [14.7 \text{ psi} \times 144]\ \text{lbf/ft}^2$

P_2 = minimum injection pressure + head loss

$= 4.37 + 1.0 = 5.37$ psig

$= (5.37 + 14.7)$ psia $= 20.1$ psia

$= (20.1)(144) = 2890\ \text{lb f/ft}^2$

hp theoretical

$$= 3.03 \times 10^{-5} [(14.7) \times (144)] [(14) \times (5)] \ln \frac{2890}{(14.7)(144)}$$

$= 1.40$ hp

$$\text{hp actual} = \frac{\text{hp-theoretical}}{E}$$

Assuming isothermal efficiency of 60%
the actual horsepower required for
the compressor

$$= \frac{1.40}{60\%} = 2.33 \text{ hp}$$

Use 111 CFM, 5.6 HP positive displacement
blower.

CLIENT	JOB NUMBER		
SUBJECT			
BASED ON	DRAWING NUMBER		
BY	CHECKED BY	APPROVED BY	DATE

Electrical Energy required

[illegible] [illegible] Blower

$$56\ HP \cdot \frac{[illegible]}{HP} \left| \frac{1\ kW}{1000\ W} \right| \frac{24 \times 365\ h}{}$$

$= [illegible]$ kWh

APPENDIX E1-4

ALTERNATIVE 4
DESIGN CALCULATIONS AND BLOCK FLOW DIAGRAM

Calculations for Groundwater Extraction System – Groundwater Alternative 4 – SWMU 12

As shown in Appendix E1-1, approximately 2 years of pumping at two extraction wells at 3 gpm/well is required to capture the groundwater beneath the SWMU No. 12 area.

Volume of Groundwater pumped during those 2 years = (2 wells)(3 gpm/well)(1440 min/day)(365 days/year)(2 years) = 6,307,200 gallons (one pore volume)

Assuming that at least 3 pore volumes are needed to be removed to remediate groundwater plume
Total Volume of Groundwater Extracted = (6,307,200 gal/pore volume)(3 pore volumes) = 18,921,600 gallons (18.9 MG) over 6 years of pumping

Considering approximately 25 percent capacity factor, the treatment system would be designed for 8 gpm.

Primary Storage / Equalization Tank

Assuming at least one hour retention time to accommodate quick removal from extraction wells and compensate for process upsets.

Equalization Tank Capacity = 8 gpm x 60 min = 480 gallons

Adding 25 % capacity factor

Total Equalization Tank Capacity = 480 gallons x 1.25 = 600 gallons.

Primary Storage Tank = 600 gallons

Ion Exchange Unit

Select an 8 gpm ion exchange unit. The specifications of the automatic mixed bed ion exchanger are attached.

GAC Adsorption Unit

Select a 25-gpm, 330 lb. fill, high-density polyethylene, permanent, liquid-phase GAC adsorption system (liquid phase).

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Web: www.Thomasregister.com/everfilt

Quotation

Date: 28 March 2001

Quotation No.: **5342**

TO: **TETRA TECH**

ATTN: **Purshotam Juriasingani**

Fax: 865-483-2014
Ph: 865-483-9900

Terms: Net 30
Shipment: 5-7 weeks after approval
F.O.B.: Mira Loma, CA (pre-pay & add)

REF: **Automatic Mixed Bed Ion Exchanger**

We are Pleased to Quote as Follows:

Model: **SKH24-96-2A**

Configuration: two (2) 24" diameter ion exchange columns, one in operation and one in stand-by; skid mounted with automatic valves and PLC controls

Maximum Pressure: 75 psig
Minimum Required Line Pressure: 30 psig on inlet and outlet lines

Design Specifications:

- **Flow:** 8 GPM
- **Service flow Rate:** 2 gpm/ft^3
- **Resin Capacity:** adequate volume for a mixed bed consisting of up to 24" each of cation and anion resin + 6" of inert resin to separate layers during regeneration
- **Freeboard for Bed Expansion:** 75 percent
- **Backwash Water Source:** an external source of softened water
- **Pressure Vessel Dimensions:** 24"OD x 96"H sidewall; side handhole; side view port; inlet, discharge and waste nozzles; drain port; sampling ports; 316 stainless steel headers and laterals; four legs; lifting eyes

Line Sizes: 1" all lines
Manifolds Included: inlet, outlet; backwash; regenerant/rinse and waste

Line Connections: 1" MPT

Materials of Construction: carbon steel columns and skids – with anti-corrosion preparation as noted below; galvanized pipe and fittings

Sandblasting: interior surfaces are sandblasted to white metal; exterior surfaces are blasted to near-white

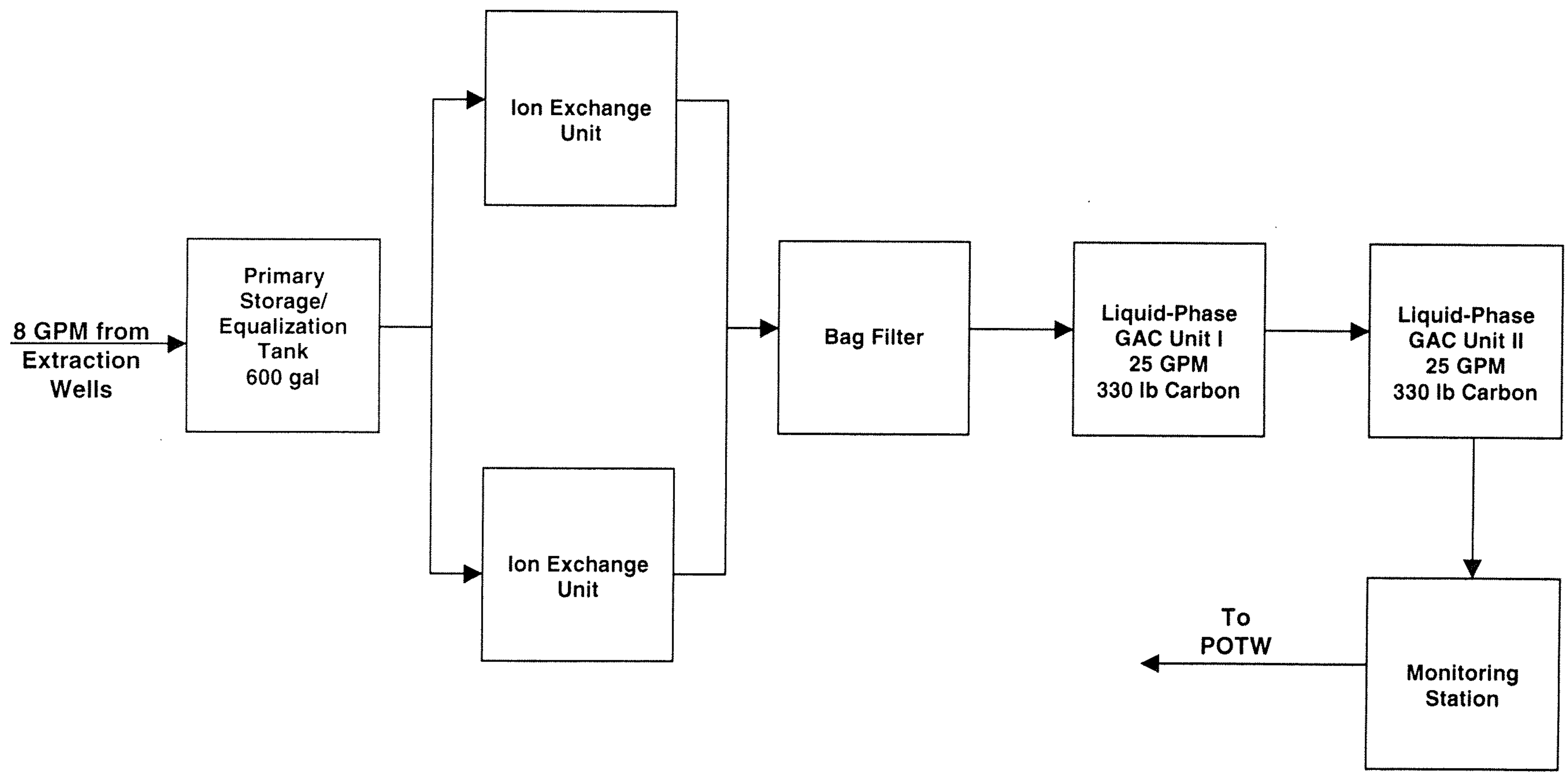
Linings & Coatings:	interior & exterior surfaces have two-part epoxy; exterior surfaces have finish coat of UV resistant high gloss urethane
Valves:	½" three-piece 316 stainless steel ball valves; pneumatic actuation with spring return
Controls:	PLC controls for service, backwash, regeneration and rinse cycles and for vessel change-over;
Resin:	the cost of resin has NOT been included in the pricing since various options are available, each with their own pricing structure; a complete water analysis should be available prior to resin selection
Air Scour:	air injection needle, valve, actuator, check valve, SS braided air hose on outlet of each column for injection of air to re-mix resin following regeneration cycle; air regulator included
Chemical Injection for Resin Regeneration:	two injection packages – one each for alkaline and acid regenerant – consisting of chemical tank, stand, pump, injection quill and interconnecting manifolds
Accessories Supplied:	pressure gauges on inlet & outlet lines; restrictor valve, air vacuum relief valve and sight tube on backwash "out" line; electric and pneumatic fittings
System Packaging:	system is factory assembled and wired; ready for connection to supply lines & power

PRICING for Above System *(excluding freight/crating):* **$ 65,483.00**

- **Deduct for User-Supplied Chemical Injection Pkgs.:** **$ - 4,000.00**

Quoted by: Barbara Andrew

Block Flow Diagram
GW Treatment – Alternative 4
SWMU 12, NAVSTA Mayport
Mayport, Florida



SWMU 17

CARBONACEOUS FUEL BOILER AREA

APPENDIX E2

APPENDIX E2-1

GROUNDWATER EXTRACTION CALCULATIONS

CLIENT: NAVSTA Mayport		JOB NUMBER: N0455	
SUBJECT: Design Extraction Well System for Groundwater Plume Capture, SWMU No. 17			
BASED ON: RFI data, EPA WHPA Model		DRAWING NO.:	
BY: A. Jenkins	CHECKED BY:	APPROVED BY:	DATE: March 23, 2001

PPROBLEM:

Design a system of groundwater extraction wells with a capture zone sufficient to mitigate the groundwater plume area at SWMU No. 17.

ASSUMPTIONS:

Each of three monitoring wells at SWMU No. 17 contains one or more COCs that exceed the MCS for groundwater. Because of the spacing and position of these wells (see Figure 3-4 and Appendix C) it is necessary to assume that the groundwater plume extends across the width and most of the length of the area defined in the RFI as SWMU No. 17, or an area approximately 300 feet wide (northwest-southeast) by 375 feet long (northeast-southwest).

Because the estimated mixing depth of the contaminant plume at SWMU No. 17 does not affect the entire thickness of the Surficial Aquifer (see Appendix), the proposed maximum depth of the extraction wells is 20 feet in to the shallow zone of the Surficial Aquifer. Although the following model simulations are based on a Surficial Aquifer thickness of 65 feet, it is assumed that 20 feet depth of penetration for the extraction wells will be sufficient to avoid total dewatering of the wells due to partial penetration affects when they are pumped at the design extraction rate.

DATA:

Data presented in the GIR and RFI reports were used to select aquifer parameters required to model the effects of groundwater extraction wells on the Surficial Aquifer. The model inputs are listed on the "Groundwater Flow Model Inputs" sheet following this calculation sheet. Prior to modeling, the "maximum gravity drainage for a fully penetrating well" in the surficial aquifer was estimated to limit the proposed pumping rate to be modeled (see following sheet). This calculation indicated that the upper limit of pumping would be about 7.6 gpm per well (for noninterfering wells). In addition, the "radius of influence" (required for estimating the maximum gravity drainage) for pumping conducted in the Surficial Aquifer was estimated using an analytical solution (see following sheet).

The initial elevation of the water table in the vicinity of the proposed extraction wells RW-1, RW-2, and RW-3 was set at 3.5 ft AMSL based on measurements presented for existing well MPT-17-MW03S in the RFI.

MODEL:

The Multiple Well Capture Zone Module (MWCAP) computational code provided in the US EPA WHAP, "A Modular Semi-Analytical Model for the Delineation of Wellhead Protection Areas", Office of Ground Water, March 1991, was used to simulate the capture zone for groundwater extraction wells proposed in Alternative No. 4. The MWCAP code delineates steady-state, time-related or hybrid capture zones for pumping wells in homogeneous aquifer with steady and uniform ambient ground-water flow. The code can simulate the effects of a nearby stream (e.g., Mayport Turning Basin) where groundwater is discharging. However, the effects of well interference in multi-well systems are ignored and each well is assumed to operate independently of each other. The two major assumptions for the MWCAP code are 1) flow in the aquifer is at steady state, and

2) flow in the aquifer is horizontal. For the problem at SWMU No. 17, both of these assumptions are reasonable. And, if the well spacing avoids aggressive overlapping of each well's capture zone, then little error should be introduced by the model's assumption of independent extraction wells.

RESLUTS:

Professional judgement, trial and error, and the model simulations were used to determine the final scenario of three extraction wells at SWMU No. 17. The goal was to balance the number of wells with the pumping rate required to capture the plume. Because the plume does not mix with the entire aquifer thickness it was desired to limit the extraction well depth and limit drawdown, which requires multiple wells to obtain the desired capture zone.

Several combinations of pumping rate and number of extraction wells were simulated. The MWCAP model was run for several time periods (2.5, 3, and 10 years) to simulate the change in the capture zone over time. The model simulations for 3 years were then overlaid to present the capture zone shown in the following figure. As shown in the figure, an extraction rate of 5 gpm at each of three extraction wells is sufficient to capture the groundwater flowing beneath SMWU No. 17 (i.e., as indicated by overlapping capture zones). The simulation indicates that a pumping period of 3 years is required to capture to plume area.

As shown in the figure, the water table contours for the pumping condition indicate that drawdown in the vicinity of the extraction wells is about 1.5 feet (drawdown in the wells is not provided by the model; however, the "maximum gravity drainage" sheet following shows that maximum drawdown for pumping at 7.6 gpm would be about 2.7 ft). Significant interference by induced flow from the Mayport Turning Basin is not indicated by the model simulation.

CONCLUSIONS:

A pumping rate of 5 gpm for each of three recovery wells located throughout SMWU No. 17 should be sufficient to capture a potential groundwater plume that underlies all of the site. The capture zones of each well will begin to aggressively overlap after about three years of pumping, assuming no significant recharge, and well interference may increase the capture zone. In addition, no affects from the Mayport Turning Basin are anticipated.

The simulated capture zone indicates that all of the water (i.e., one pore volume) beneath the contaminated area of SWMU No. 17 can be extracted within approximately three years of pumping. Recovery wells that penetrate only the upper 20 ft of the Surficial Aquifer are recommended to focus the extraction from the shallow portion of the aquifer. A pilot pump test should be performed at SWMU No. 17 to validate the aquifer parameters used in the modeling and to support the final extraction well design.

GROUNDWATER FLOW MODEL INPUTS
SWMU No. 17 - Three Recovery Well Scenario

Model Used: EPA WHPA - MWCAP (EPA Office of Groundwater, Version 2.0, March 1991).

UNITS USED FOR SIMULATION = 1
0 = METERS AND DAYS
1 = FEET AND DAYS

COORDINATE LIMITS OF STUDY AREA = 1000 by 800 foot area surrounding SWMU No. 17
XMIN = 0.00
XMAX = 1000.00
YMIN = 0.00
YMAX = 800.00

MAXIMUM STEP LENGTH = 16.00

NUMBER OF WELLS = 3

WELL NUMBER 1 = RW-1

X COORDINATE =	700.0	Approx. 20ft east of MPT-17-MW03S
Y COORDINATE =	400.0	
WELL DISCHARGE =	963.0	5 gallons per minute
TRANSMISSIVITY =	579.0	Kb = (8.9 f/d)(65 ft)
HYDRAULIC GRADIENT =	0.0014	based on RFI data
ANGLE OF AMBIENT FLOW =	0.00	flow to the northeast
AQUIFER POROSITY =	0.35	based on RFI data
AQUIFER THICKNESS =	65	based on RFI data
BOUNDARY TYPE =	STREAM BOUNDARY = Mayport Turning Basin	
DISTANCE FROM WELL TO BOUNDARY =	300	distance to M.T.B.
ORIENTATION OF LOCAL COORDINATE SYSTEM =	180	NW by SE edge of M.T.B.
SELECTED CAPTURE ZONE OPTION =	TIME-RELATED, capture zone at 3 years	
TRAVEL TIME VALUE =	1095	3 years of pumping
CAPTURE ZONE BOUNDARY PLOTTING OPTION =	YES	
NUMBER OF PATHLINES =	10	particles tracked

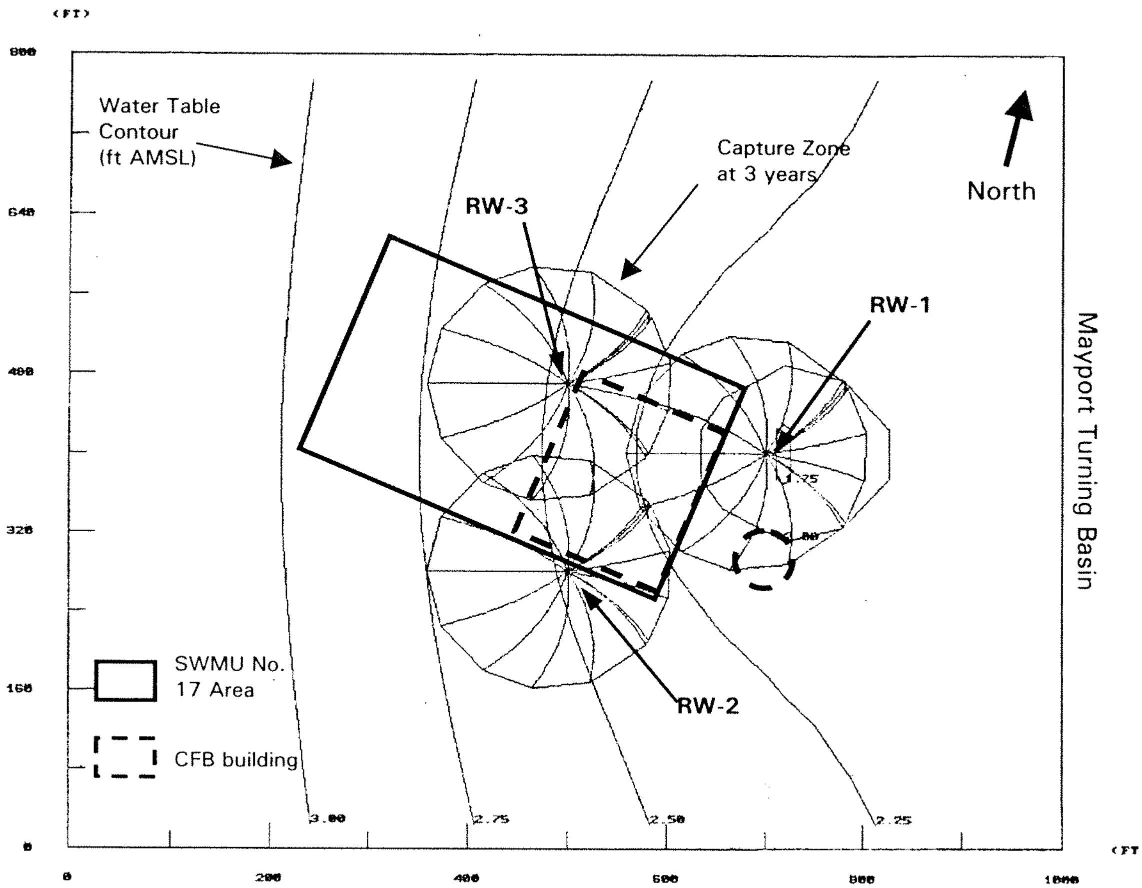
WELL NUMBER 2

X COORDINATE =	500.0	Approx. 20ft east of MPT-17-MW01S
Y COORDINATE =	280.0	
WELL DISCHARGE =	963.0	(same as above)
TRANSMISSIVITY =	579.0	
HYDRAULIC GRADIENT =	0.0014	
ANGLE OF AMBIENT FLOW =	0.00	
AQUIFER POROSITY =	0.35	
AQUIFER THICKNESS =	65	
BOUNDARY TYPE =	STREAM BOUNDARY	
DISTANCE FROM WELL TO BOUNDARY =	300	
ORIENTATION OF LOCAL COORDINATE SYSTEM =	180	
SELECTED CAPTURE ZONE OPTION =	TIME-RELATED	
TRAVEL TIME VALUE =	1095	
CAPTURE ZONE BOUNDARY PLOTTING OPTION =	YES	
NUMBER OF PATHLINES =	10	

WELL NUMBER 3 (continued on next page)

X COORDINATE =	500.0 Approx. 20ft east of MPT-17-MW02'
Y COORDINATE =	470.0
WELL DISCHARGE =	963 (same as above)
TRANSMISSIVITY =	579
HYDRAULIC GRADIENT =	0.0014
ANGLE OF AMBIENT FLOW =	0.00
AQUIFER POROSITY =	0.35
AQUIFER THICKNESS =	65
BOUNDARY TYPE =	STREAM BOUNDARY
DISTANCE FROM WELL TO BOUNDARY =	300
ORIENTATION OF LOCAL COORDINATE SYSTEM =	180
SELECTED CAPTURE ZONE OPTION =	TIME-RELATED
TRAVEL TIME VALUE =	1095
CAPTURE ZONE BOUNDARY PLOTTING OPTION =	YES
NUMBER OF PATHLINES =	10

SWMU NO. 17 – GROUNDWATER ALTERNATIVE 4
EXTRACTION WELL CAPTURE ZONE
NAVSTA MAYPORT – MAYPORT, FLORIDA



- Three extraction wells located near existing monitoring wells MPT-17-MW01S, -02S, and –03S.
- Pumping rate of 5 gallons per minute for each well.
- Steady-state capture zones at 3 years of pumping.
- Water table contour elevations shown in feet AMSL; initial level of 3.5 feet AMSL at RW-1.

SOLUTION FOR MAXIMUM DRAWDOWN (S max.) IN A FULLY PENETRATING PUMPING WELL AT MAXIMUM DISCHARGE
(from M.J. Gefell, et al, GROUNDWATER, MAY-JUNE, 1994)

S max. = $\{-b+/-[b^2-4ac]^{0.5}\}/2a$

a = [1/ln(R/r)] where S max. = maximum water-table drawdown, ft

R = estimated radius of influence, ft

b = -2{r+[H/ln(R/r)]} r = well effective radius, or radius of borehole w/ filter pack, ft

c = 2rH H = aquifer saturated thickness, ft

K = horizontal hydraulic conductivity, ft/day

NAVSTA Mayport - SWMU No. 17			
r =	0.42		
H =	65		
Case:	1	2	3
K =	7.2	8.9	10.2
R =	247	275	294
a =	0.157	0.154	0.153
b =	-21.226	-20.889	-20.684
c =	54.6	54.6	54.6
S max. =	**2.62**	**2.67**	**2.69**

(KOZENY, 1953) SOLUTION FOR MAXIMUM GRAVITY DRAINAGE INTO A FULLY PENETRATING PUMPING WELL AT MAXIMUM DRAWDOWN
(from M.J. Gefell, et al, GROUNDWATER, MAY-JUNE, 1994)

Q max. = AKi = 2(3.14)rhK

Q max. = maximum pumping rate at total drawdown in well, gpm
A = surface area of seepage face into well, ft^2
K =aquifer hydraulic conductivity, ft/day
i = 1, unit hydraulic gradient with steady state gravity drainage
r = well effective radius, or radius of borehole w/ filter pack, ft
h = saturated thickness at well, or height of seepage face into well, ft
h = H - S max., ft **(see calculation above for S max.)**

NAVSTA Mayport - SWMU No. 17						
Case:	1		2		3	
K =	7.2		8.9		10.2	
r =	0.42					
for h,	h, feet	Q, gpm	h, feet	Q, gpm	h, feet	Q, gpm
Q =	62.38	6.15	62.33	7.60	62.31	8.71

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT NAVY NAVSTA MAYPORT	JOB NUMBER N0455
SUBJECT Estimate Radius of Influence for Recovery Well, SWMU No. 17	
BASED ON	DRAWING NUMBER

BY A. Jenkins	CHECKED BY	APPROVED BY	DATE Mar. 22, 2001

Problem: Estimate Radius of Influence, R_o, for a well pumping from the shallow zone of the Surficial Aquifer

Given: Equation to estimate the order of magnitude of R_o (Powers, 1991)

$$R_o = r_w + \sqrt{\frac{Tt}{C_s}}$$

where
r_w = well radius, ft
T = aquifer transmissivity = Kb
K = hydraulic conductivity
b = saturated thickness
t = time of pumping, days
C_s = aquifer specific yield

Data:

K = 8.9 ft/day, average for aquifer in Group II SWMUs area, range is 7.2 to 10.2 ft/day

b = approximately 65 ft for the Surficial Aquifer; 70 ft depth to top of Hawthorn minus 5 ft depth to water table at SWMU No. 12

C_s = 0.23, assume 2/3 of total pore volume (n = 0.35 in GIR) will drain

r_w = assume 6 inch well in 10 inch borehole with filter pack

t = assume recovery well reaches steady state in 30 days

Calculation:

$$R_o = 0.42\,ft + \sqrt{\frac{(8.9\,f/d)(65\,f)(30\,d)}{0.23}}$$

$$R_o = 275\,ft$$

for $K = 7.2$ f/d, $R_o = 247$ ft
for $K = 10.2$ f/d, $R_o = 294$ ft

Ref: Powers, J.P., 1981, Construction Dewatering, John Wiley & Sons.

APPENDIX E2-2

ALTERNATIVE 3
DESIGN CALCULATIONS AND BLOCK FLOW DIAGRAM

Calculations for Groundwater Treatment System – Groundwater Alternative 3 – SWMU 17

As shown in Appendix E2-1, because the capture zones overlap after 3 years of pumping, approximately 2.5 years of pumping at three extraction wells at 5 gpm/well is required to capture one pore volume of the groundwater beneath the SWMU No. 17 area.

Volume of Groundwater pumped during those 2.5 years = (3 wells)(5 gpm/well)(1440 min/day)(365 days/year)(2.5years) = 19,710,000 gallons (one pore volume)

Assuming that at least 3 pore volumes are needed to be removed to remediate groundwater plume
Total Volume of Groundwater Extracted = (19,710,000 gal/pore volume)(3 pore volumes) = 59,130,000 gallons (59.13 MG) over 7.5 years of pumping

Considering approximately 25 percent capacity factor, the treatment system would be designed for 20 gpm.

Primary Storage / Equalization Tank

Assuming at least one hour retention time to accommodate quick removal from extraction wells and compensate for process upsets.

Equalization Tank Capacity = 20 gpm x 60 min = 1,200 gallons

Adding 25 % capacity factor

Total Equalization Tank Capacity = 1200 gallons x 1.25 = 1,500 gallons.

Primary Storage Tank = 1,500 gallons

Green Sand Filter

Select 20 gpm green sand filter. The specifications of the automatic green sand filter are attached.

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FAX
3 Pages

27 March 2001

TO: Purshotam Juriasingani

FROM: Barbara Andrew

RE: **Quotation for Greensand Filter**

Dear Purshotam:

Here's the first of two quotes I promised. The ion exchanger will be faxed on Wednesday. Call if you have questions or need anything further.

Regards,

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Quotation

Date:	27 March 2001	**Quotation No.:**	**5338**
TO:	**TETRA TECH**	**Terms:**	Net 30
		Shipment:	4-6 weeks after approval
ATTN:	**Purshotam Juriasingani**	**F.O.B.:**	Mira Loma, CA (pre-pay & add)
Fax:	865-483-2014	**REF:**	**Automatic Greensand Filter**
Ph:	865-483-9900		

We are Pleased to Quote as Follows:

Model: **SKH24-48-3A**

Configuration: three (3) 24" diameter vertical pressure filters, skid mounted with automatic valves and controls

Maximum Pressure: 75 psig
Minimum Required Line Pressure: 30 psig on inlet and outlet lines

Design Specifications:
- **Flow:** 20 GPM
- **Service flow Rate:** 2.13 gpm/sq ft
- **Removal:** iron & manganese
- **Backwash Flow:** 37 GPM (@ 12 gpm/sq ft)
- **Duration:** 2-3 minutes per vessel
- **Freeboard for Bed Expansion:** 50 percent
- **Backwash Water Source:** an external source of clean water fed via a line pressurized to within 5% of inlet line pressure

Pressure Vessel Dimensions: 24"OD x 48"H sidewall; side manway; top fill port; bottom drain port; 304 stainless steel internals; four legs; lifting eyes

Line Sizes: 2" all lines
Manifolds Included: inlet, outlet; 1 ½" backwash "in & out"

Line Connections: 2" flanged in and out

Materials of Construction: carbon steel – with anti-corrosion preparation as noted below

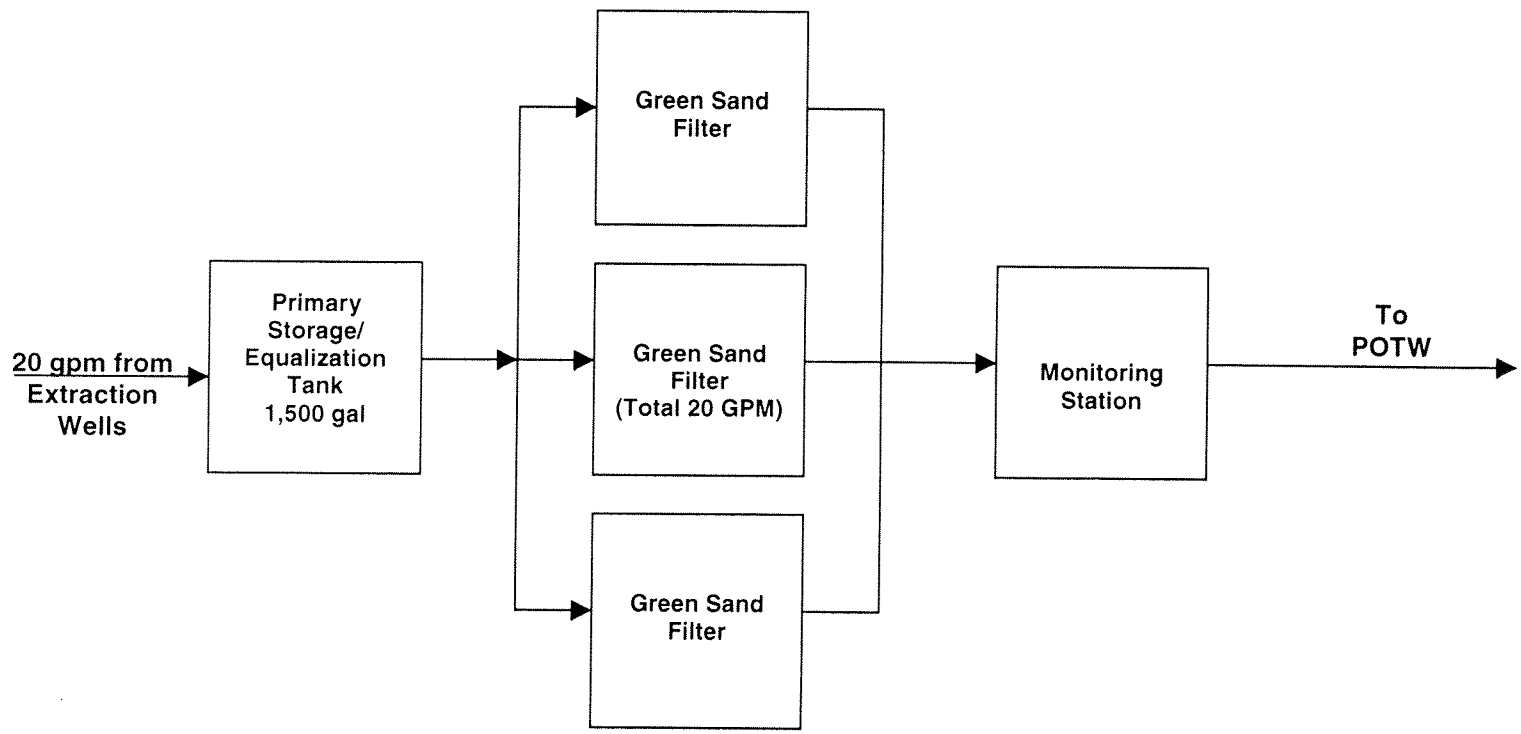
Sandblasting: interior surfaces are sandblasted to white metal; exterior surfaces are blasted to near-white

Linings & Coatings:	interior & exterior surfaces have two-part epoxy; exterior surfaces have finish coat of UV resistant high gloss urethane
Valves:	3" multi-port piston style and 1 ½" globe valves; hydraulically actuated with water internal to the system
Controls:	solid state electronics in a SS enclosure; controls initiate backwash at pre-set time interval or pressure differential override; fully programmed; field adjustable settings; manual override; circuit breaker; mode lamps; optional dry contacts
Media Supplied:	each vessel has 32" deep bed of manganese greensand, atop an underbed of ¾" crushed gravel
Chemical Injection:	chemical tank, stand, pump, mixer, injection quill and interconnecting manifold for continuous injection of potassium permanganate
Accessories Supplied:	pressure gauges on inlet & outlet lines; restrictor valve, air vacuum relief valve and sight glass on backwash "out" line; electric and hydraulic fittings
System Packaging:	system is factory assembled and wired; ready for connection to supply lines & power

PRICING for Above System ***(excluding freight/crating):*** **$ 20,802.00**

Quoted by: Barbara Andrew

Block Flow Diagram
GW Treatment – Alternative 3
SWMU 17, NAVSTA Mayport
Mayport, Florida



APPENDIX F

SUPPORTING INFORMATION

SWMU 12

NEUTRALIZATION BASIN

COMPOSITION OF SEA WATER

JENKINS

Study and Interpretation of the Chemical Characteristics of Natural Water

Third Edition

United States Geological Survey Water-Supply Paper 2254

U.S. DEPARTMENT OF THE INTERIOR
March 3, 1849

minerals as coatings, cement, or discrete particles. The precipitate rocks, such as limestone and dolomite, generally are aggregates of calcitic or dolomitic particles, with many impurities, and may be aggregates of detrital material rather than massive crystalline precipitates. More extensive discussions of classification and identification are contained in texts on sedimentary rocks.

THE HYDROSPHERE

The hydrosphere is generally defined by geochemists as the vapor, liquid, and solid water present at and near the land surface, and its dissolved constituents. Water vapor and condensed water of the atmosphere are usually included, but water that is immobilized by incorporation into mineral structures in rocks is usually not thought of as part of the hydrosphere.

The oceans constitute about 98 percent of the hydrosphere, and thus the average composition of the hydrosphere is, for all practical purposes, that of seawater. The water of the ocean basins is generally fairly well mixed with regard to major constituents, although concentrations of most minor elements are not uniform with depth or areally. The average concentrations of the major dissolved elements or ions, and of some of the minor ones, are given in table 2, which is based on a compilation by Goldberg and others (1971). These authors also suggested, on the basis of stabilities of complex species, the predominant forms in which the dissolved constituents occur.

Substantial differences in concentration between water near the surface and water at depth, as well as areally, are characteristic of solutes that are used as nutrients by marine life. Some of the minor elements have distributions that resemble those of the nutrients. Quinby-Hunt and Turekian (1983) used this and other types of correlations to estimate mean oceanic concentrations of most of the elements. Their estimates, and results of extensive continuing research since 1971 on the behavior of minor elements in seawater, suggest that previously accepted mean values for many of these elements were too large. Average concentrations for minor constituents given in table 2 are useful in a broadly descriptive sense, but they may not be of much value in defining individual elemental behavior.

For various reasons, many geochemists have compiled estimates of the average composition of river water. Obviously, the chemical composition of surface runoff waters of the Earth is highly variable through both time and space, and this book discusses the variations and reasons for them at some length. For our purposes a global average has little significance except, perhaps, as a baseline for comparison. A widely quoted average computed by Livingstone (1963) is given in table 3. The value given in his published average for dissolved iron

Table 2. Composition of seawater

[After Goldberg and others (1971)]

Constituent	Concentration (mg/L)	Principal form(s) in which constituent occurs
Cl	19,000	Cl^-
Na	10,500	Na^+
SO_4	2,700	SO_4^{2-}
Mg	1,350	Mg^{2+}
Ca	410	Ca^{2+}
K	390	K^+
HCO_3	142	HCO_3^-, $H_2CO_3(aq)$, CO_3^{2-}
Br	67	Br^-
Sr	8	Sr^{2+}
SiO_2	6.4	$H_4SiO_4(aq)$, $H_3SiO_4^-$
B	4.5	$H_3BO_3(aq)$, $H_2BO_3^-$
F	1.3	F^-
N	.67	[a]NO_3^-
Li	.17	Li^+
Rb	.12	Rb^+
C (organic)	.10	....
P	.09	HPO_4^{2-}, $H_2PO_4^-$, PO_4^{3-}
I	.06	IO_3^-, I^-
Ba	.02	Ba^{2+}
Mo	.01	MoO_4^{2-}
Zn	.01	Zn^{2+}
Ni	.007	Ni^{2+}

Table 2. Composition of seawater—Continued

Constituent	Concentration (mg/L)	Principal form(s) in which constituent occurs
As	.003	$HAsO_4^{2-}$, $H_2AsO_4^-$
Cu	.003	Cu^{2+}
Fe	.003	
U	.003	$UO_2(CO_3)_3^{4-}$
Mn	.002	Mn^{2+}
V	.002	$VO_2(OH)_3^{2-}$
Al	.001	
Ti	.001	
Sn	.0008	
Co	.0004	Co^{2+}
Cs	.0003	Cs^+
Sb	.0003	
Ag	.0003	$AgCl_2^-$
Hg	.0002	$HgCl_2(aq)$
Cd	.00011	Cd^{2+}
W	.0001	WO_4^{2-}
Se	.00009	SeO_4^{2-}
Ge	.00007	$Ge(OH)_4(aq)$
Cr	.00005	
Ga	.00003	
Pb	.00003	Pb^{2+}, $PbCl_3^-$, $PbCl^+$
Bi	.00002	
Au	.00001	$AuCl_4^-$
Nb	.00001	
Ce	.000001	
Sc	<.000004	
La	.000003	$La(OH)_3(aq)$
Y	.000003	$Y(OH)_3(aq)$
Be	.0000006	
Th	<.0000005	
Pa	2×10^{-9}	
Ra	1×10^{-10}	Ra^{2+}

[a] Does not include dissolved N_2.

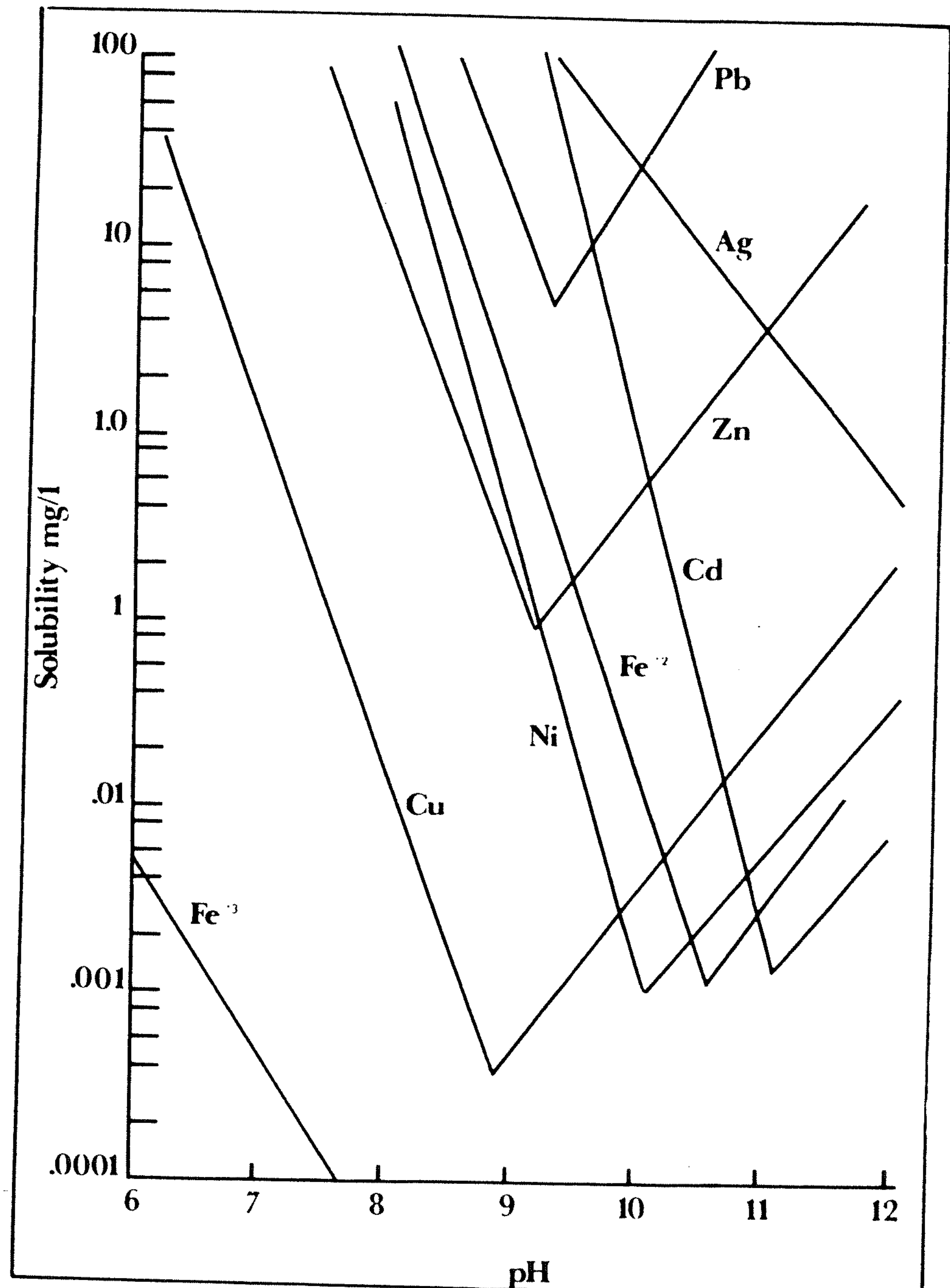
appears to be much too high and is omitted here. Meybeck (1979) has compiled more recent data on river water composition and has computed an average total concentration slightly lower than that of Livingstone. This average is also given in table 3. With coworkers (for example, Martin and Meybeck, 1979), Meybeck has also studied composition of particulate matter carried to the ocean by rivers and many of the factors that influence river-water quality.

Averages like those of Livingstone and Meybeck are strongly influenced by the composition of the world's large rivers. An average analysis for the Mississippi is given in table 3, along with a single analysis for the Amazon, the world's largest river. The major-ion composition of the Mississippi is well known, through many years of intensive sampling. That of the Amazon, however, was poorly known until studies by Brazilian and other scientific agencies were intensified in the 1960's and 1970's. The average discharge for the Mississippi into the Gulf of Mexico is given by Iseri and Langbein (1974) as 18,100 m^3/sec (640,000 ft^3/sec). For the Amazon, a total mean discharge to the ocean of 175,000 m^3/sec (6,100,000 ft^3/sec) was estimated by Oltman (1968). The analysis for the Amazon is of a sample taken at a time of high discharge, and the water has a lower than average concentration of dissolved ions. The period represented by the Mississippi River analysis had an average discharge nearly equal to the long-term mean and is probably more nearly representative of average conditions than the analysis given in the second edition of this book.

THE ATMOSPHERE

The composition of the atmosphere in terms of volume percentage and partial pressures of the gaseous

SOLUBILITIES OF METAL HYDROXIDES AT VARIOUS pHs



Experimentally determined solubilities of metal hydroxides.

FIGURE 5-1. Solubilities of metal hydroxides at various pH's. (Courtesy of Graver Water.)

APPENDIX G

DRAFT CMS COMMENTS & RESPONSES

Response to EPA Comments on
Corrective Measures Study
Solid Waste Management Unit Numbers 12 and 17
Naval Station Mayport
March 2001

General Comments

1. In the executive summary and in the body of the CMS, references are made to the volume and square footage of contaminated soil and groundwater. Two values are usually given, one for organic contaminants and one for inorganic contaminants, without any mention of whether the smaller volume or area is within the larger volume or area. It is necessary to refer to the drawings in Appendix C to determine that:

- for SWMU 12, the smaller area of organic contamination in groundwater is within the larger area or inorganic contamination,
- for SWMU 17, there are two separate areas of soil contamination which consist of both organic contamination and inorganic contamination in each, and
- for SWMU 17, the smaller area of inorganic contamination in groundwater is within the larger area of inorganic contamination.

Explaining in the text the information given in the above bulleted items should eliminate these points of confusion.

Response: For SWMU 12, Figure 2-3 will be modified to add the plumes on the map and Section 2.4.2 will be modified as follows:

Based on the data evaluated for this CMS, plumes of organic and inorganic compounds were identified within SWMU ~~No.~~ 12 that exceeded the MCS for groundwater. The areas and volumes of groundwater contaminant plumes are based solely on human health risks ~~evaluation only.~~ because ~~T~~the groundwater at SWMU ~~No.~~ 12 was not considered an ecological concern as discussed in Section 2.1.1.3. Estimates of pore volume of these plumes resulted in approximately 140,000 gallons of organic (phenol) and 690,000 gallons of inorganic (metals) contaminated groundwater. The volume estimate was made using a plume depth of 4.2 feet. The estimated area of contamination is approximately 12,400 feet^2 for organics (phenol) and 61,300 feet^2 for inorganics (metals). For SWMU 12, the smaller area of organic contamination in groundwater is within the larger area or inorganic contamination. ~~The volume estimate was made using a plume depth of 4.2 feet.~~ The locations of wells containing the exceedances of the COCs are presented in Figure 2-3. Details of the estimates for volume of groundwater are presented in Appendix C.

For SWMU 17, Figures 3-3 and 3-4 will be modified to add the plumes on the map and Sections 3.4.1 and 3.4.2 will be modified as follows:

3.4.1 Volume of Soil

Based on the data collected during the RFI, ~~plumes~~ areas of organic~~s~~ contamination within and near SWMU ~~No.~~ 17 were identified that exceeded the MCS for the surface soil. Because no human health or ecological COCs were identified for subsurface soil, the volume of contaminated subsurface soil was not calculated. The area and volume of surface soil contamination are based solely on human health risks ~~evaluation only~~ because there are no ecological concerns due to the absence of terrestrial ecological receptors and the presence of an asphalt cover at the site which is located in ~~the~~an industrialized area. There are two separate areas of soil contamination which consist of both organic contamination. ~~Contaminated soil thickness ranged from 0 to 2 feet for the surface soil.~~ The estimated area of contamination is approximately 15,700 feet^2 of organics (7,850 feet^2 of benzo(a)pyrene and 7,850 feet^2 of dieldrin). Contaminated soil thickness ranged from 0 to 2 feet for the surface soil. The total estimated volume is approximately 1,164~~5~~ yard^3 of organic (582 yard^3 of benzo(a)pyrene and 582 yard^3 of dieldrin) contaminated soil. The locations of the soil borings containing the exceedances of the COCs are presented in Figure 3-3. Details of the estimate for the contaminated soil are presented in Appendix C.

3.4.2 Volume of Groundwater

Based on the data collected during the RFI, plumes of inorganics within and near SWMU ~~No.~~ 17 were identified that exceeded the MCSs for the groundwater. The areas and volumes of contaminated groundwater are based solely on human health risks ~~evaluation only.~~ because ~~T~~the groundwater at SWMU ~~No.~~ 17 was not considered as ecological concern as discussed in Section 3.1.4. Estimates of pore volume of these plumes resulted in approximately 9,700,000 gallons of metal (iron and manganese) contaminated groundwater and 1,900,000 gallons of ammonia contaminated groundwater. The volume estimate was made using a plume depth of 42 feet. Estimated area of contamination is approximately 87,800 feet^2 for metals (iron and manganese) and 17,400 feet^2 for ammonia. For SWMU 17, the smaller area of metal contamination in groundwater is within the larger area of ammonia contamination. ~~The volume estimate was made using a plume depth of 42 feet.~~ The locations of wells containing the exceedances of the COCs is presented in Figure 3-4. Details of the estimates for volume of contaminated groundwater are presented in Appendix C.

Specific Comments

1. **Page 1-2, Figure 1-1**. The boundary of Naval Station Mayport should be highlighted on this figure.

Response: A replacement figure is provided as Attachment 1.

2. **Page 1-7, First Bulleted Item**. In discussing the relationship between tidal fluctuation and groundwater levels, this item states that a time lag of approximately 7.5 to 11 hours exists. Page 2-10 states that the time lag is 4 to 6 hours. This inconsistency should be eliminated.

Response: The RFI states a lag time of 7.5 to 11 hours. Page 2-20 will be changed accordingly.

3. **Page 2-8, Fourth Paragraph**. This paragraph states that detected concentrations were compared with RFI background concentrations for both inorganics and organics. There are no "background" values for organics. This should be clarified.

Response: The paragraph will be modified as follows:

Analytes detected in groundwater were screened as ecological chemicals of potential concern (COPC-Es) by a comparison of the average detected concentration with RFI background concentration for inorganic~~s, organic~~ compounds~~,~~ and ~~FDEP~~ Chapter ~~F.A.C.~~ 62-302 F.A.C. ~~surface~~ Surface ~~water~~ Water ~~q~~Quality ~~standards~~ Standards for Class III ~~m~~Marine ~~w~~Waters. Eight of 21 analytes detected in groundwater were selected as COPC-Es including three VOCs (1,1-dichloroethane, 1,2-dichlorobenzene, and 1,2-dichloroethene), one SVOC (4-nitrophenol), and four inorganics (copper, lead, nickel, and vanadium).

4. **Page 2-9, Last Partial Paragraph**. This discussion is confusing. For example, the first sentence lists the inorganic constituents which were detected in the surface soil samples. This list includes cobalt, mercury and nickel. The second sentence states that none of the analytes were detected at concentrations greater than their background screening values. The next sentence states that cobalt and mercury were detected in site samples but not in the background samples. If this were the case, cobalt and mercury would have to be at concentrations greater than background values. That sentence also states that nickel was detected only in the background samples. This is in contrast to the first sentence which states that nickel was detected in the soil samples. These points of confusion should be eliminated.

Response: The paragraph does correctly restate the text from the CCED document but the CCED document is incorrect. The paragraph will be modified as following:

Inorganic analytes detected in the surface soil samples consisted of arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, zinc, and cyanide. Cobalt and mercury ~~None of the analytes~~ were the only constituents detected at concentrations greater than their respective background screening values referenced in the CCED document (location MPT-11-SS01).~~. However, cobalt and mercury were detected in the samples collected adjacent to the Neutralization Basin but not in the background sample, and nickel was detected only in the background sample.~~ Only arsenic was detected at a concentration that slightly exceeded the residential soil cleanup goal. However, the concentration of arsenic did not exceed the industrial cleanup goal.

5. **Page 2-67, Last Sentence**. This sentence references the implementation of selected corrective measures. This should be changed to the recommended corrective measures.

Response: Change made ad requested.

6. **Page 3-5, Second Paragraph**. In the second sentence of this paragraph, "None of the organic compounds. . . ." should be changed to "None of the inorganic analytes . . ."

Response: Change made as requested.

7. **Page 3-73, Last Sentence**. This sentence references the implementation of selected corrective measures. This should be changed to the recommended corrective measures.

Response: Change made as requested.

Attachment A - Figure 1-1

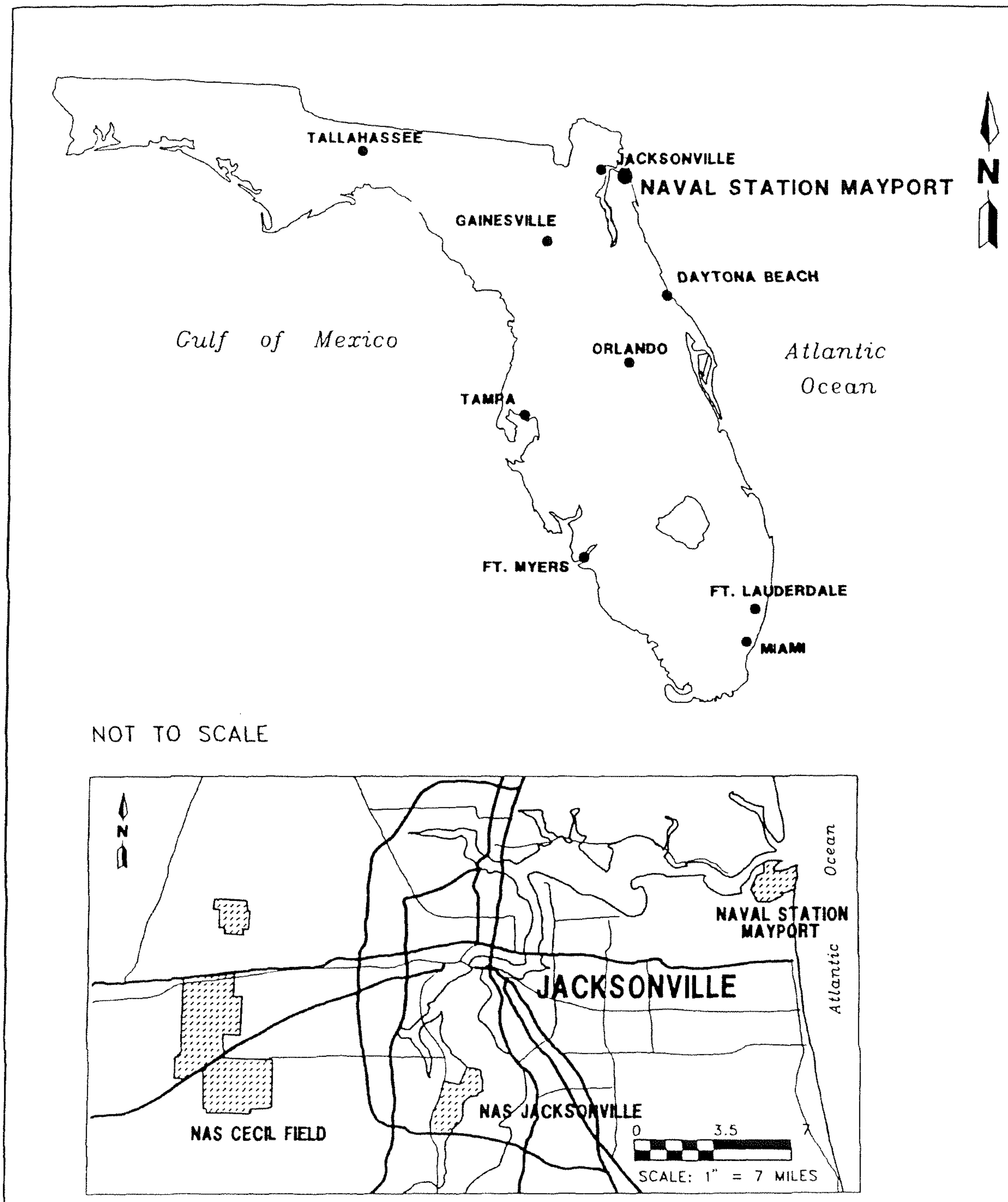


FIGURE 1-1
FACILITY LOCATION MAP

RCRA FACILITY ASSESSMENT WORKPLAN, GROUP IV SWMUs

U.S. NAVAL STATION MAYPORT, FLORIDA

000100/KGP-WDW-GLC-SB/5-5-95

GRP4SWMU.RFA
PMW.10.95

Source: ABB-ES, 1995a.

RESPONSE TO FDEP COMMENTS DATED APRIL 11, 2001
Corrective Measure Study For SWMU 12 and 17
NAVSTA Mayport, Mayport, FL

James Cason, P.G.

COMMENT 1: As also pointed out by Mr. Brown, lowering the pH of the groundwater at SWMU 12 may increase the metal ion concentration. The remedial action should be carefully considered.

Response 1: Please refer to Response No. 8.

COMMENT 2: Tables 1 - 1 through 1-5 denote calculated background screening values for several organic constituents and pesticides. We have discussed background and derived screening values only for inorganic materials. The Navy should insure that screening values for organic compounds should not be utilized in the risk evaluation (as was apparently done in Section 2.1.1.3 RFI Assessment of Ecological Impacts and Section 2.4.2 Volume of Groundwater). The Navy should finalize the existing background technical evaluation document so that it can be formally adopted.

Response 2: Table 1-1 through 1-5 contains new background screening values calculated since the RFI was written. The new background screening report was submitted on November 17, 2000. The background screening values for organic compounds and pesticides were not used for the determination of COCs in this CMS. The sentence in Section 2.1.1.3 will be corrected to remove the reference of organic compounds. The sentence will be modified to: "Analytes detected in groundwater were screened as ecological chemicals of potential concern (COPC-Es) by a comparison of the maximum detected concentration with RFI background concentration for inorganics and Chapter 62-302 F.A.C. surface water quality standards for Class III marine waters."

COMMENT 3: Section 2.3. Chemicals of Concern-Ecological: the assumption of groundwater dilution as it reached surface water by a factor of 10 is not allowable (no dilution can be assumed). This section should be reevaluated.

Response 3: The assumption that some dilution will occur as groundwater is discharged to the surface water was referenced in the ecological exposure assessment section of the RFI. The RFI does not state the technical basis of assuming the dilution by 10 times but it is anticipated that it is based on the risk experience and substitutes appropriate model simulations. The dilution stated in the RFI can be interpreted as the reduction in the concentrations of the chemicals just before it enters St. Johns River and not dilution in the St. Johns River.

To determine if the assumption of the reduction in the concentration of the chemicals by 10 times is appropriate, a groundwater model can be used to determine the concentration of the chemicals before entering the St. Johns River. The processes that would naturally reduce the concentration of chemicals are advection, dispersion, mixing, and adsorption of the chemicals as it travels through the aquifer. The concentration reaching St. John's River would then be compared to the ecological benchmarks.

The BIOSCREEN model (Attachment 1) was used to determine the approximate concentrations at the point of exposure (St. Johns River) for copper, lead, and nickel which are the ecological COPCs identified in the RFI (Attachment 2). The Bioscreen model was selected to simulate the natural reductions in the inorganic chemicals because the model is accepted by FDEP and USEPA and the input parameters can be adjusted to simulate the above-mentioned natural processes with no biodegradation. The maximum concentration detected during RFI was used as the initial concentration in the BIOSCREEN model because it represents the worst case condition. The model was used to simulate groundwater flow for a period of 500 years. The model predicted the concentrations of copper, nickel, and lead to be negligible (or zero) at the point of exposure (St. Johns River, less than 50 feet from the source) until 500 years indicating that the combined reduction ratios for the natural processes would be greater than 10. In addition as stated in the RFI, the fraction of metals biologically available and potentially toxic to the aquatic receptors is considerable less than the measured concentration. Therefore, the comparison of ecological benchmarks with the contaminant concentrations assuming 10 times reduction is protective of the environment.

The sentence in Section 2.3 will be modified to reflect the occurrence of natural processes (advection, dispersion, mixing, and adsorption) within the aquifer instead of dilution in the river. The sentence from the RFI will be clarified and modified to: "In the RFI, a conclusion of no effects to aquatic receptors assumed groundwater concentration reduction of ten times due to advection, dispersion, mixing, and adsorption of chemicals in the aquifer before it enters the St. Johns River."

COMMENT 4: Section 2.4.2. Volume of Groundwater: the statement is made that "the groundwater was not of ecological concern." This is not the case since the close proximity of the St. Johns River makes that concern a priority.

Response 4: The conclusions were made by the fact that there were no ecological COCs identified in the RFI. Please see response No 3. The sentence from the RFI will be clarified and modified to: "The concentration of chemicals in groundwater are not high enough to present an ecological concern".

COMMENT 5: Section 2.5 Identification and Screening of Corrective Measures Technologies: in paragraph two, the statement is made, "Because there is no soil contamination at SWMU 12..." The Navy is reminded that in the Installation Land Use Control Memorandum of Agreement, the LUCIP for SWMU 12, page C-27, states that the site has land use controls on it based specifically on arsenic in soil. This section should be reevaluated.

Response 5: The LUCIP for SWMU 12 was developed based on the exceedance of the concentrations of chemicals when compared to the FDEP residential SCTLs. In the CMS, the COCs are determined assuming the future use of the site is industrial and therefore the chemical concentrations are compared to the FDEP industrial SCTLs. As per Table 2-4 in the CMS, arsenic was not determined to be an industrial COC at SWMU 12. Because there were no industrial use soil COCs identified at SWMU 12, technologies involving treatment or removal were not considered.

To determine if SWMU 12 can be considered for No Further Action for surface soil, a comparison of the chemical concentrations were made to the FDEP residential SCTLs as shown in Attachment 3. The CMS will be revised to include the result of the residential screening. The process to determine the residential COCs is similar to the process used to determine the industrial COCs except that the residential SCTLs were used in determination of the residential COCs. Because arsenic was determined as a residential COC, the recommendation in the CMS to implement the non residential LUCIP is still applicable.

COMMENT 6: Section 3.1.2 RFI Evaluation: in the second paragraph, the statement is made that arsenic and beryllium could not be related to releases at SWMU 17. As previously noted for SWMU 12, arsenic is one component of the basis for land use restriction in the LUCIP for SWMU 17 in the Installation Land Use Control Memorandum of Agreement for Mayport Naval Station.

Until such time that the Navy can formally relate those contaminants to the dredge material emplacement, arsenic and beryllium should be included in the evaluation.

Response 6: The LUCIP for SWMU 17 was developed based on the exceedance of the concentrations of chemicals to the FDEP residential SCTLs. In the CMS, the COCs are determined assuming the site is industrial and therefore the chemical concentrations are compared to FDEP industrial SCTLs. As shown in Table 3-3 through 3-7, arsenic and beryllium were included in the evaluation but were not determined to be industrial COCs in the soil at SWMU 17.

Based on the recommendations in the CMS, LUCIP for SWMU 17 will be revised to keep the site non residential.

Greg Brown, P.E., Professional Engineer II

COMMENT 7: Final engineer documents should be signed and sealed by a Florida licensed professional engineer with responsible charge.

Response 7: As suggested, the final CMS will be signed and sealed by a Florida licensed Professional Engineer.

COMMENT 8: The reported groundwater pH of about 11 s.u. at SWMU No. 12 is close to the point of theoretical minimum solubility for the metals of concern (note Appendix F). Lowering the pH would theoretically increase the potential for solubilization of metals rather than decrease it. Basic water quality measurements such as (but not limited to) pH, bicarbonate, carbonate, and hydroxide alkalinity should be obtained before final remedy selection and implementation to confirm the feasibility and effectiveness of proposed alternatives.

Response 8: The spill of sodium hydroxide at SWMU 12 greatly increased the pH causing the naturally present metals in the soil to be released to the groundwater. At high pH, the particles in the soil matrix becomes negatively charged and it is anticipated that the metals are released in the form of metal anions. However, when the pH is reduced, the physical or chemical processes due to pH reduction may not follow the curves as shown in Figure 5-1. Figure 5.1 is technically only valid for the exact soil types and groundwater used for the tests. Figure 5.1 shows that the metals can be solubalized at a high pH and can be used for determining general trends and not specific numbers. As mentioned in "Remediation of Metals-Contaminated Soils and Groundwater", the sorption of metal anions increases as the pH is lowered. Although, the current pH at SWMU 12 indicates the occurrence of processes shown on left side of the curves in Figure 5-1, the actual physical-chemical processes at SWMU 12 are most likely different than the conditions of the tests used to determine Figure 5-1 due site-specific complexes formed in groundwater and it is anticipated that the concentrations would be further reduced as the pH returns to normal. Sampling data for the site would be required to prove that the metal concentrations would be reduced as the pH is reduced. Results from the recent groundwater sampling event (discussed below) shows some reduction in metal concentrations.

During the August 2001 sampling event, all inorganic COC concentrations (nickel, vanadium, and copper in MPT-11-MW02S and iron in MPT-11-MW03S) were lower than the concentrations detected during the RFI (Attachment 4). The concentration of nickel during August 2001 sampling event was 6.63 ug/L (MPT-11-MW02S) which was less than the MCS of 8.3 μg/L. The result for the only organic COC (phenol) was uncertain because the phenol concentration of 150 ug/L was reported in the duplicate sample and the concentration of 64 ug/L was reported in the equipment blank. The pH measured during August 2001 sampling event was 5.71-9.29 (MPT-11-MW02S) as compared to 11.4 measured in July 1994. As per the hypothesis the concentrations of the metals in groundwater were found to be generally lower due to reduction in the pH.

As a result of the new data, the proposed Alternative 3, "LUCs, Confirmatory Investigation, In Situ Treatment, and Monitoring" would be replaced with the Alternative 2, "LUC and Monitoring" in the CMS. However, additional groundwater monitoring is also recommended for SWMU 12.

COMMENT 9: LUCs have direct administrative expenses as well as opportunity loses. I suggest the Mayport team consider estimating the trade-offs of surface soil remediation at SWMU No. 17 to permit future unrestricted land use verses LUCs. I understand that groundwater restrictions may still likely be necessary. Nonetheless, limited surface soil removal may open up many more beneficial land uses that would be restricted otherwise.

Response 9: Although the cost of Alternative 4 (LUCs, Removal, and TSDF Disposal) is much higher than the proposed Alternative 3 (LUCs, Monitoring, and Asphalt Cover) and the cost to excavate all soil exceeding residential standards would be significantly higher, the comparisons will be presented to the Mayport team for review.

(ATTACHEMNT 1)
BIOSCREEN

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence *Version 1.4*

Run Name
NAVSTA Mayport
SWMU 12, Copper

Data Input Instructions:

115 ▸ 1. Enter value directly....or
or 2. Calculate by filling in grey
0.02 cells below. (To restore formulas, hit button below)

Variable* ▸ Data used directly in model.
20 ▸ Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	77.6	(ft/yr)
or		or	
Hydraulic Conductivity	K	2.1E-03	(cm/sec)
Hydraulic Gradient	i	0.0125	(ft/ft)
Porosity	n	0.35	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	12.5	(ft)
Transverse Dispersivity*	alpha y	1.3	(ft)
Vertical Dispersivity*	alpha z	0.0	(ft)
or		or	
Estimated Plume Length	Lp	250	(ft)

3. ADSORPTION

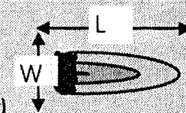
Retardation Factor*	R	2079.9	(-)
or		or	
Soil Bulk Density	rho	1.7	(kg/l)
Partition Coefficient	Koc	389090	(L/kg)
FractionOrganicCarbon	foc	1.1E-3	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	0.0E+0	(per yr)
or		or	
Solute Half-Life	t-half	0.000	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO		(mg/L)
Delta Nitrate*	NO3		(mg/L)
Observed Ferrous Iron*	Fe2+		(mg/L)
Delta Sulfate*	SO4		(mg/L)
Observed Methane*	CH4		(mg/L)

5. GENERAL

Modeled Area Length*	250	(ft)
Modeled Area Width*	100	(ft)
Simulation Time*	500	(yr)



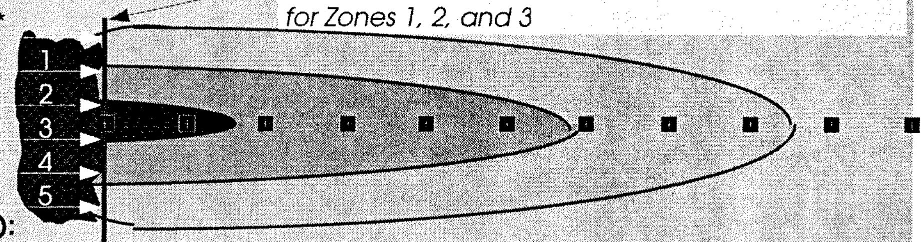
6. SOURCE DATA

Source Thickness in Sat.Zone* 4.2 (ft)

Source Zones:

Width* (ft)	Conc. (mg/L)*
10	0.0197
15	0.0197
50	0.0197
15	0.0197
10	0.0197

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Source Halflife (see Help):

Inst. React.	1st Order	
>1000	>1000	(yr)

Soluble Mass 20.50 (Kg)
In Source NAPL, Soil

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)											
Dist. from Source (ft)	0	25	50	75	100	125	150	175	200	225	250

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — View Output

RUN ARRAY — View Output

Help

Recalculate This Sheet

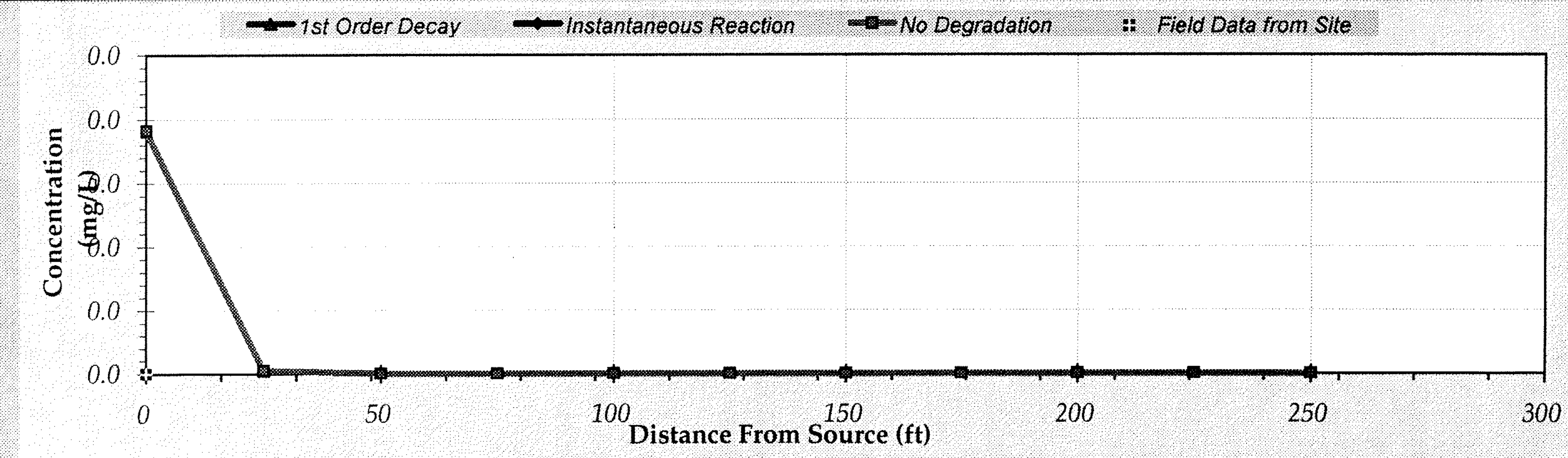
Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

BIOSCREEN – NO DEGRADATION MODEL FOR COPPER

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft) 0	25	50	75	100	125	150	175	200	225	250
No Degradation	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time:

100 Years

Return to Input

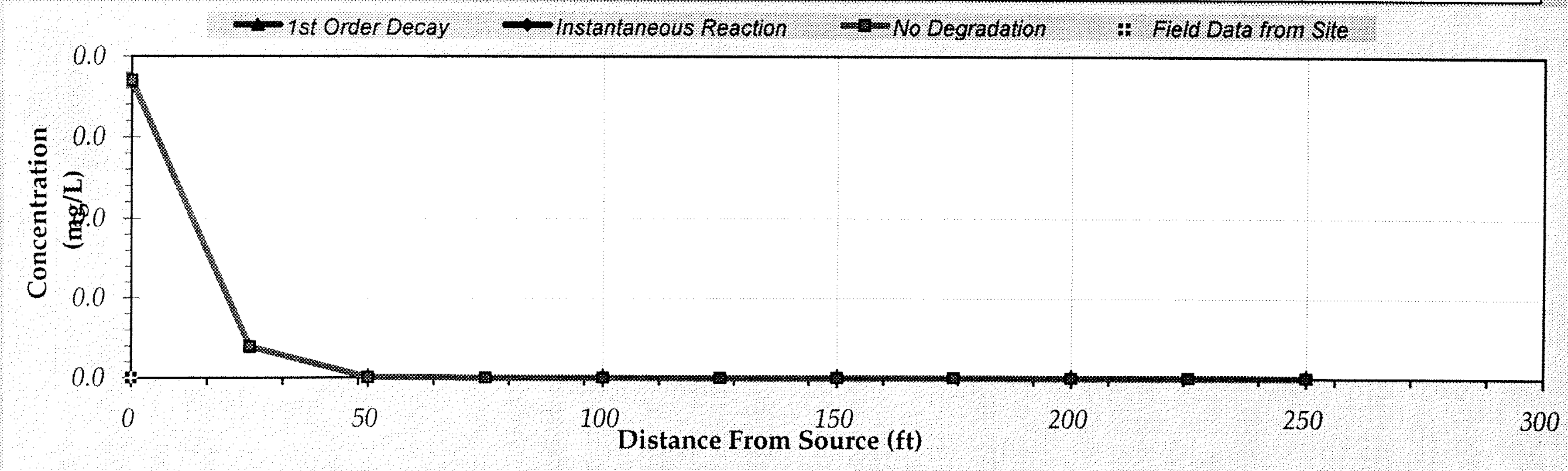
Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR COPPER

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	25	50	75	100	125	150	175	200	225	250
No Degradation	0.019	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.019	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.019	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time:

200 Years

Return to Input

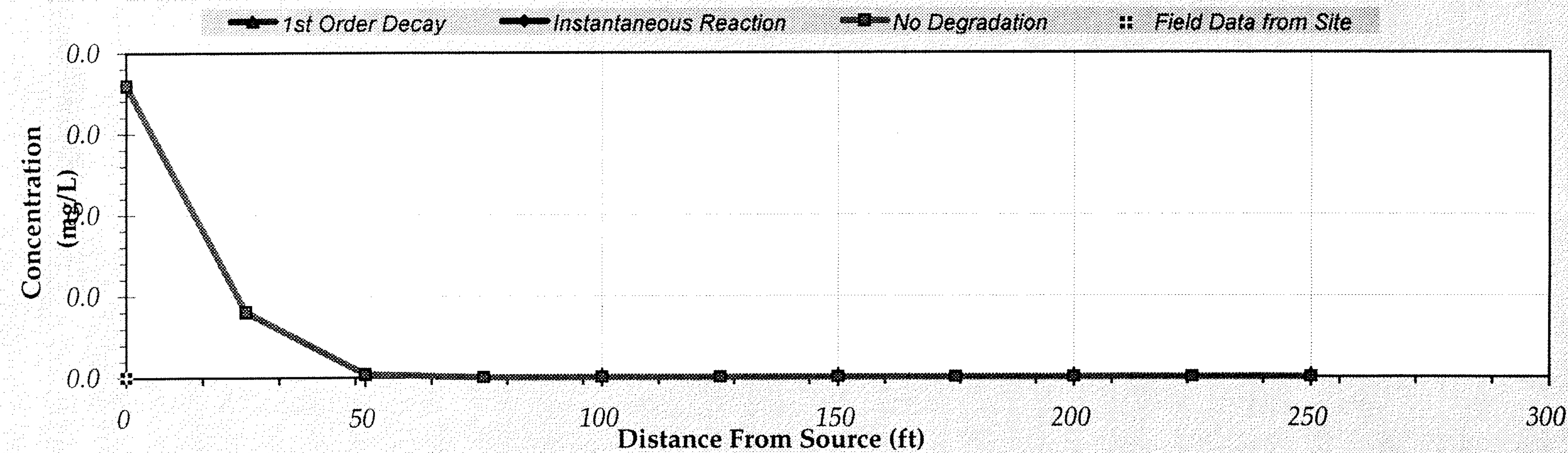
Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR COPPER

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	25	50	75	100	125	150	175	200	225	250
No Degradation	0.018	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.018	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.018	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time:

300 Years

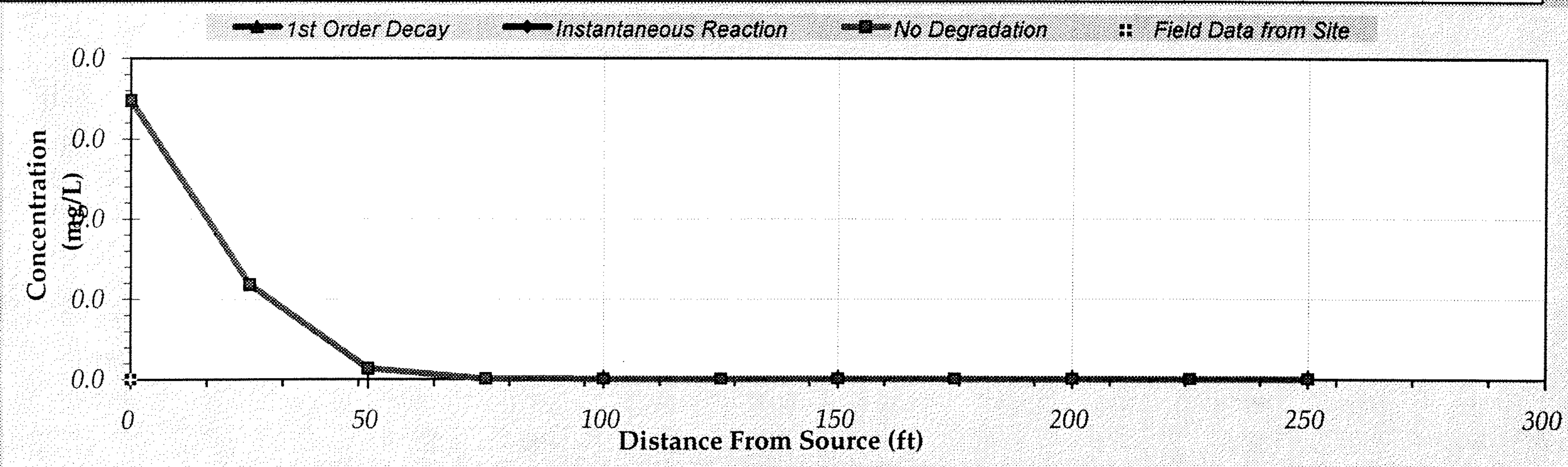
Return to Input

Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR COPPER

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	25	50	75	100	125	150	175	200	225	250
No Degradation	0.017	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.017	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.017	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time:

400 Years

Return to Input

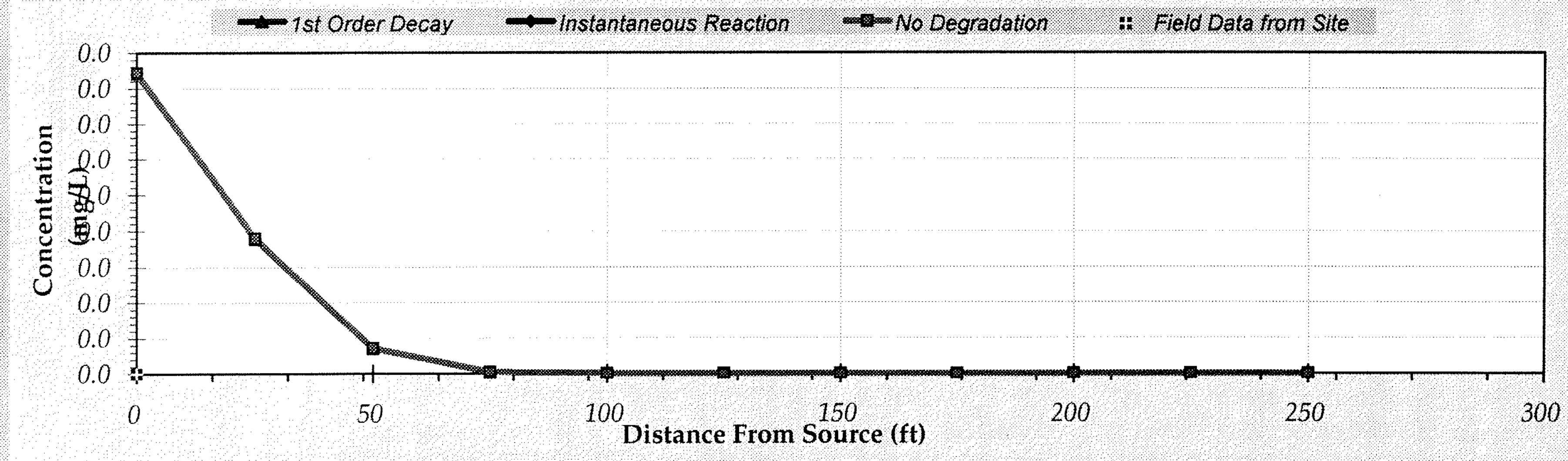
Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR COPPER

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	25	50	75	100	125	150	175	200	225	250
No Degradation	0.017	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.017	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.017	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time: 500 Years

Return to Input

Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR COPPER

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence

Version 1.4

NAVSTA Mayport
SWMU 12, Lead
Run Name

Data Input Instructions:

115 ▸ 1. Enter value directly....or
↑ or
0.02 ▸ 2. Calculate by filling in grey cells below. (To restore formulas, hit button below)

Variable* ▸ Data used directly in model.
20 ▸ Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	77.6	*(ft/yr)*
or		↑ *or*	
Hydraulic Conductivity	*K*	2.1E-03	*(cm/sec)*
Hydraulic Gradient	*i*	0.0125	*(ft/ft)*
Porosity	*n*	0.35	*(-)*

2. DISPERSION

Longitudinal Dispersivity*	*alpha x*	6.5	*(ft)*
Transverse Dispersivity*	*alpha y*	0.7	*(ft)*
Vertical Dispersivity*	*alpha z*	0.0	*(ft)*
or		↑ *or*	
Estimated Plume Length	*Lp*	90	*(ft)*

3. ADSORPTION

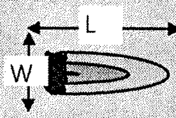
Retardation Factor*	*R*	4372.4	*(-)*
or		↑ *or*	
Soil Bulk Density	*rho*	1.7	*(kg/l)*
Partition Coefficient	*Koc*	818181	*(L/kg)*
FractionOrganicCarbon	*foc*	1.1E-3	*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	0.0E+0	*(per yr)*
or		↑ *or*	
Solute Half-Life	*t-half*	0.000	*(year)*
or Instantaneous Reaction Model			
Delta Oxygen*	*DO*		*(mg/L)*
Delta Nitrate*	*NO3*		*(mg/L)*
Observed Ferrous Iron*	*Fe2+*		*(mg/L)*
Delta Sulfate*	*SO4*		*(mg/L)*
Observed Methane*	*CH4*		*(mg/L)*

5. GENERAL

Modeled Area Length*	60	*(ft)*
Modeled Area Width*	120	*(ft)*
Simulation Time*	500	*(yr)*



6. SOURCE DATA

Source Thickness in Sat.Zone* 4.2 *(ft)*

Source Zones:

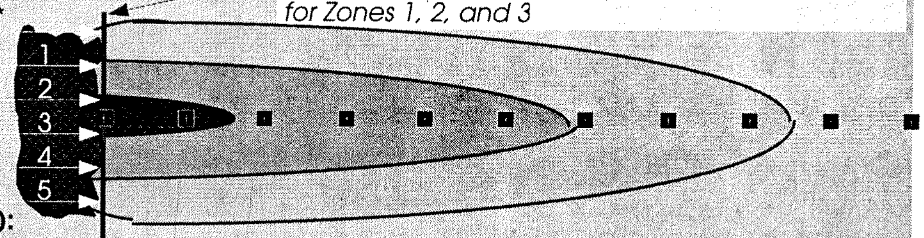
Width* (ft)	Conc. (mg/L)*
10	0.0057
20	0.0057
60	0.0057
20	0.0057
10	0.0057

Source Halflife (see Help):

800	800	*(yr)*
Inst. React.	1st Order	

Soluble Mass 2.56 *(Kg)*
In Source NAPL, Soil

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)												
Dist. from Source (ft)	0	6	12	18	24	30	36	42	48	54	60	

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | **View Output**

RUN ARRAY | **View Output**

Help

Recalculate This Sheet

Paste Example Dataset

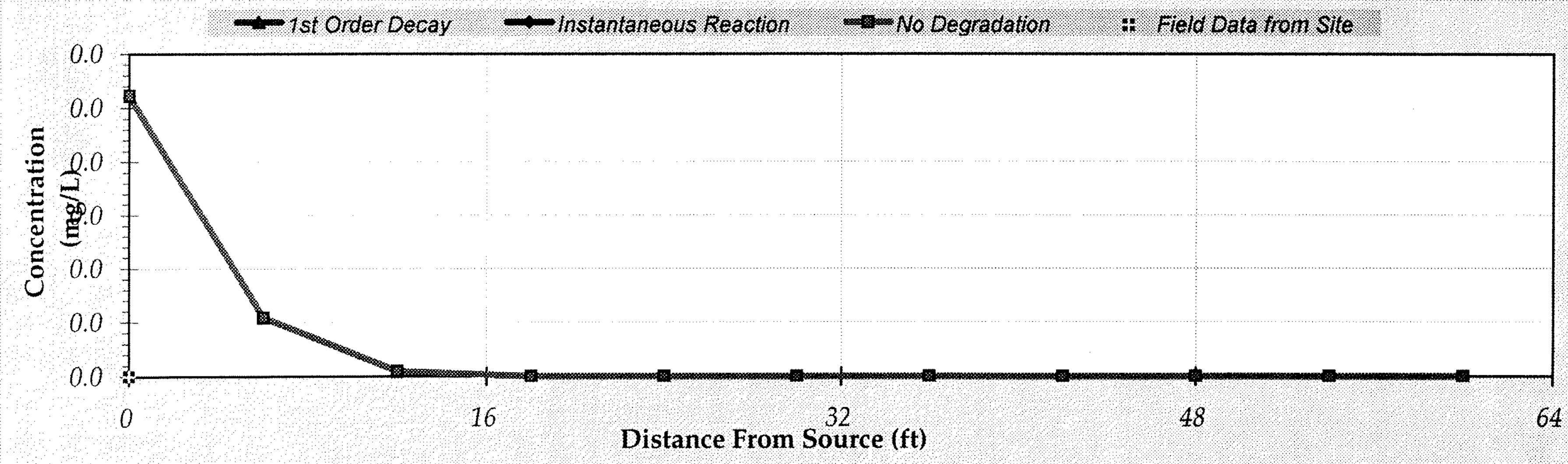
Restore Formulas for Vs, Dispersivities, R, lambda, other

BIOSCREEN – NO DEGRADATION MODEL FOR LEAD

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	6	12	18	24	30	36	42	48	54	60
No Degradation	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time: 100 Years

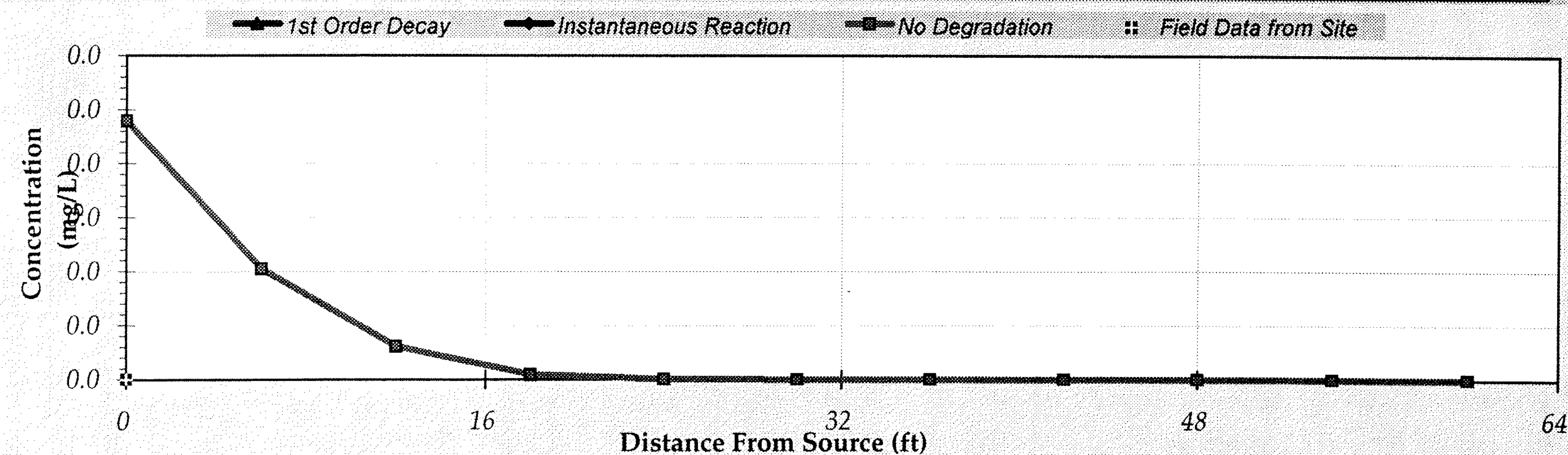
Return to Input

Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR LEAD

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft) 0	6	12	18	24	30	36	42	48	54	60
No Degradation	0.005	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.005	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.005	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time: 200 Years

Return to Input

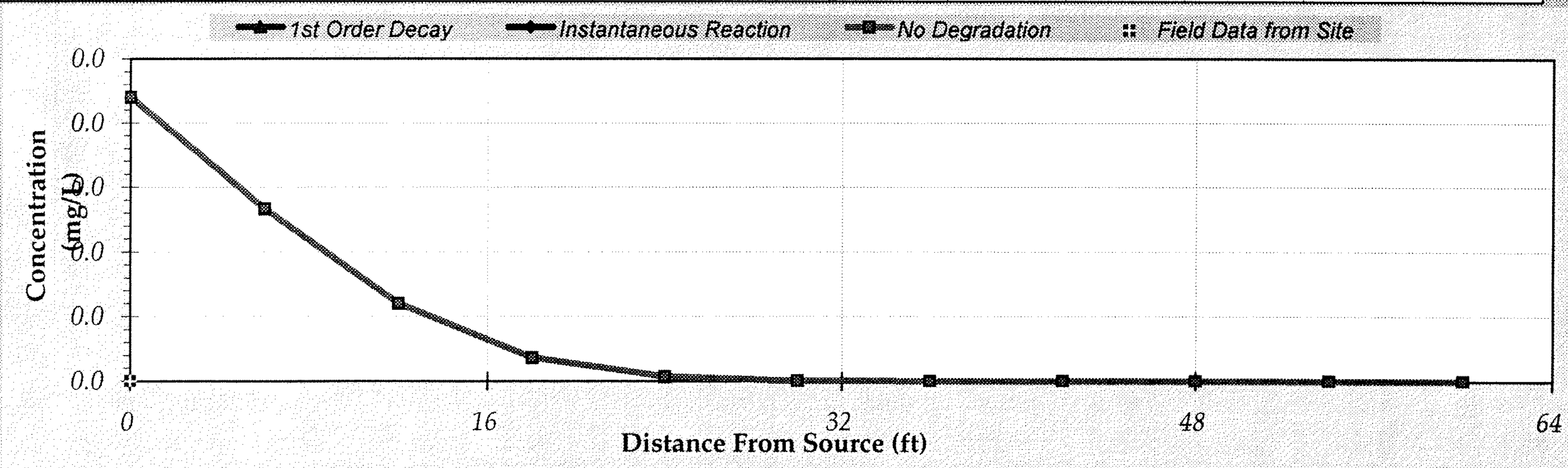
Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR LEAD

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	6	12	18	24	30	36	42	48	54	60
No Degradation	0.004	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.004	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.004	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time:

300 Years

Return to Input

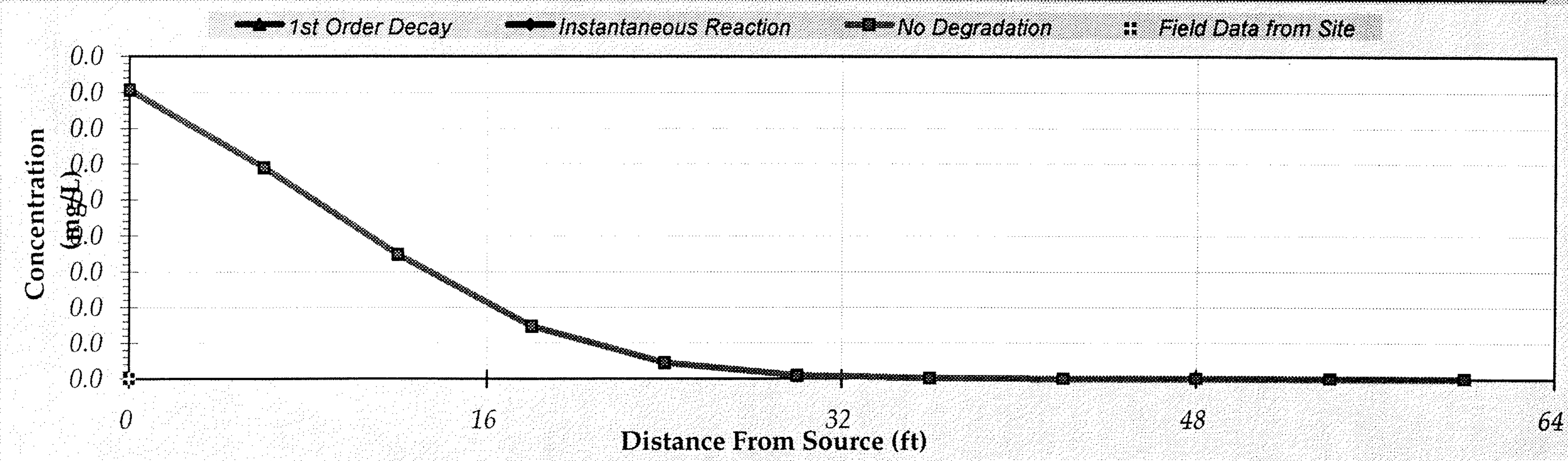
Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR LEAD

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	6	12	18	24	30	36	42	48	54	60
No Degradation	0.004	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.004	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.004	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time:

400 Years

Return to Input

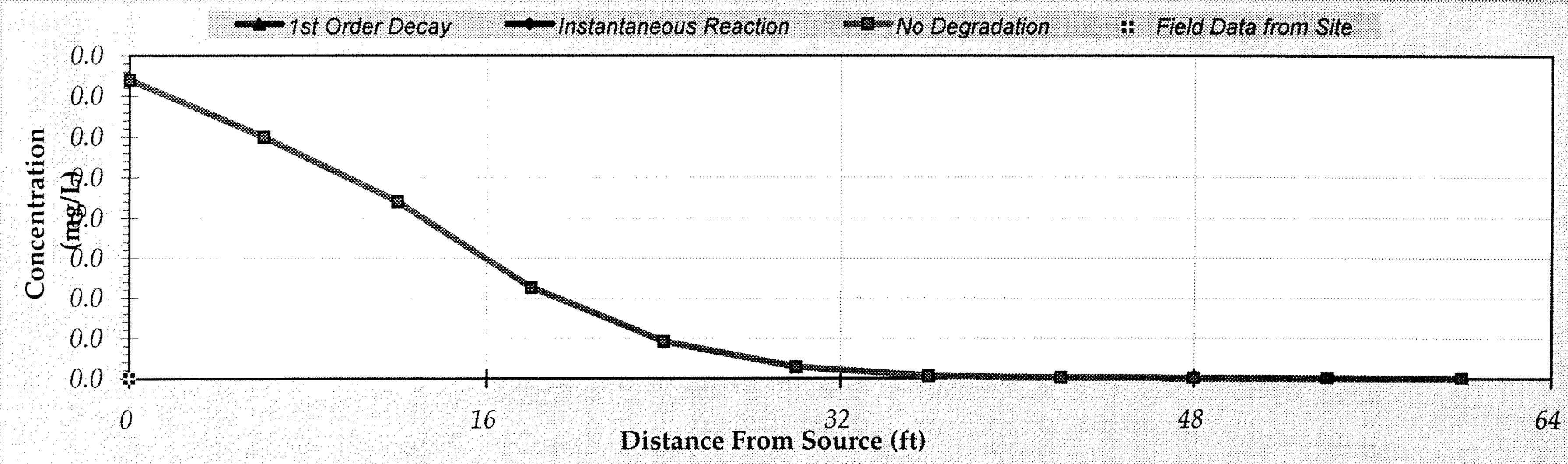
Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR LEAD

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	6	12	18	24	30	36	42	48	54	60
No Degradation	0.004	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.004	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.004	0.003	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time: 500 Years

Return to Input

Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR LEAD

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence

Version 1.4

NAVSTA Mayport	
SWMU 12, Nickel	
Run Name	

Data Input Instructions:

115 → 1. Enter value directly....or
↑ or
0.02 → 2. Calculate by filling in grey cells below. (To restore formulas, hit button below)

Variable* → Data used directly in model.
20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	77.6	*(ft/yr)*
or		↑ *or*	
Hydraulic Conductivity	*K*	2.1E-03	*(cm/sec)*
Hydraulic Gradient	*i*	0.0125	*(ft/ft)*
Porosity	*n*	0.35	*(-)*

2. DISPERSION

Longitudinal Dispersivity*	*alpha x*	8.0	*(ft)*
Transverse Dispersivity*	*alpha y*	0.8	*(ft)*
Vertical Dispersivity*	*alpha z*	0.0	*(ft)*
or		↑ *or*	
Estimated Plume Length	*Lp*	120	*(ft)*

3. ADSORPTION

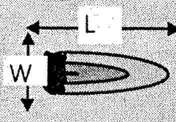
Retardation Factor*	*R*	9229.6	*(-)*
or		↑ *or*	
Soil Bulk Density	*rho*	1.7	*(kg/l)*
Partition Coefficient	*Koc*	1727272	*(L/kg)*
FractionOrganicCarbon	*foc*	1.1E-3	*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	0.0E+0	*(per yr)*
or		↑ *or*	
Solute Half-Life	*t-half*	0.000	*(year)*
or Instantaneous Reaction Model			
Delta Oxygen*	*DO*		*(mg/L)*
Delta Nitrate*	*NO3*		*(mg/L)*
Observed Ferrous Iron*	*Fe2+*		*(mg/L)*
Delta Sulfate*	*SO4*		*(mg/L)*
Observed Methane*	*CH4*		*(mg/L)*

5. GENERAL

Modeled Area Length*	120	*(ft)*
Modeled Area Width*	65	*(ft)*
Simulation Time*	500	*(yr)*



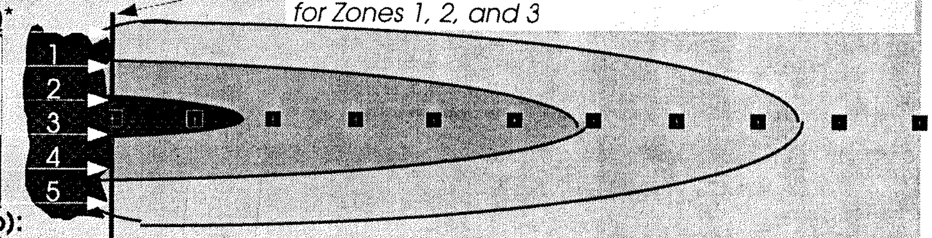
6. SOURCE DATA

Source Thickness in Sat.Zone* 4.3 *(ft)*

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3

Source Zones:

Width* (ft)	Conc. (mg/L)*
5	0.0204
15	0.0204
25	0.0204
15	0.0204
5	0.0204



View of Plume Looking Down

Source Halflife (see Help):

Inst. React.	1st Order	
>1000	>1000	*(yr)*

Soluble Mass 6.62 *(Kg)*
In Source NAPL, Soil

7. FIELD DATA FOR COMPARISON

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

Concentration (mg/L)											
Dist. from Source (ft)	0	12	24	36	48	60	72	84	96	108	120

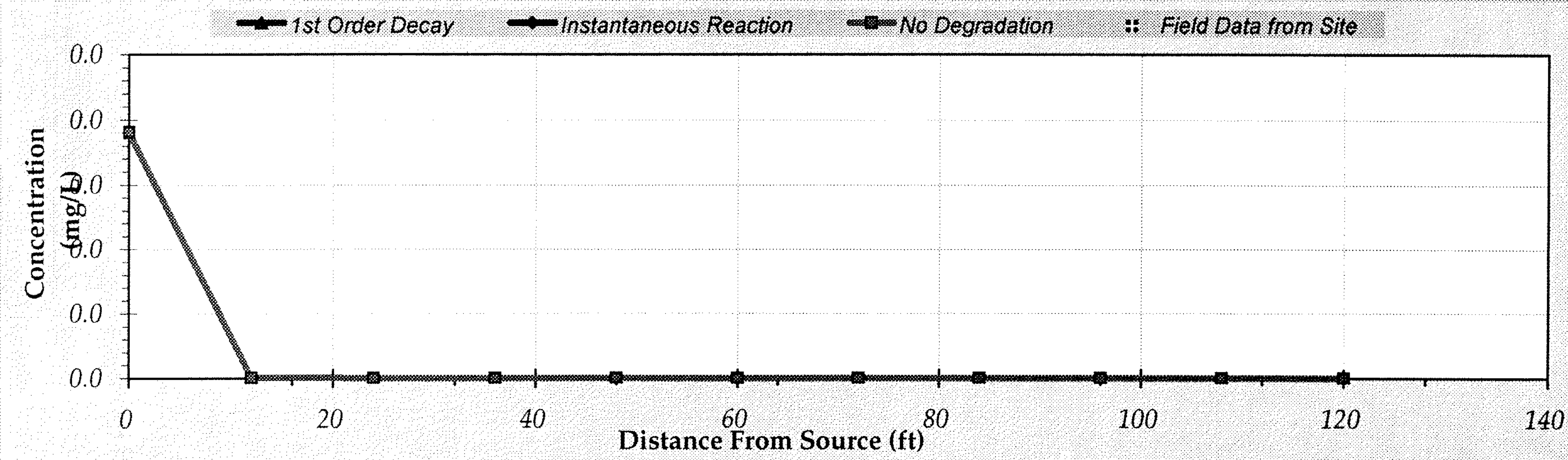
8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | View Output
RUN ARRAY | View Output
Help | Recalculate This Sheet
Paste Example Dataset
Restore Formulas for Vs, Dispersivities, R, lambda, other

BIOSCREEN – NO DEGRADATION MODEL FOR NICKEL

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	12	24	36	48	60	72	84	96	108	120
No Degradation	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time:

100 Years

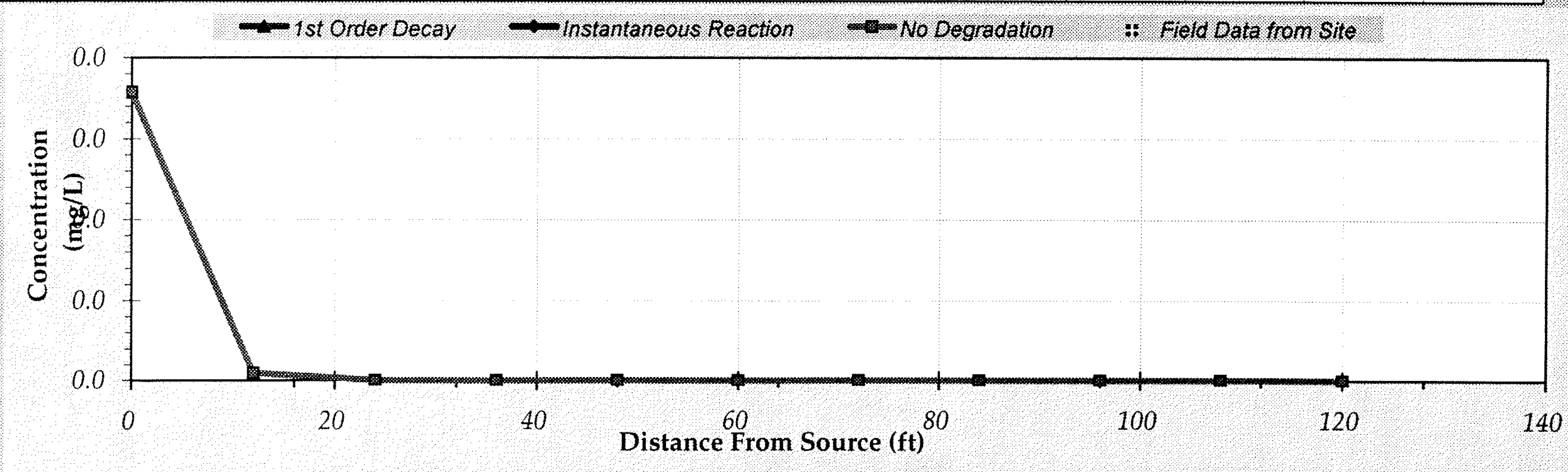
Return to Input

Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR NICKEL

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	12	24	36	48	60	72	84	96	108	120
No Degradation	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time: 200 Years

Return to Input

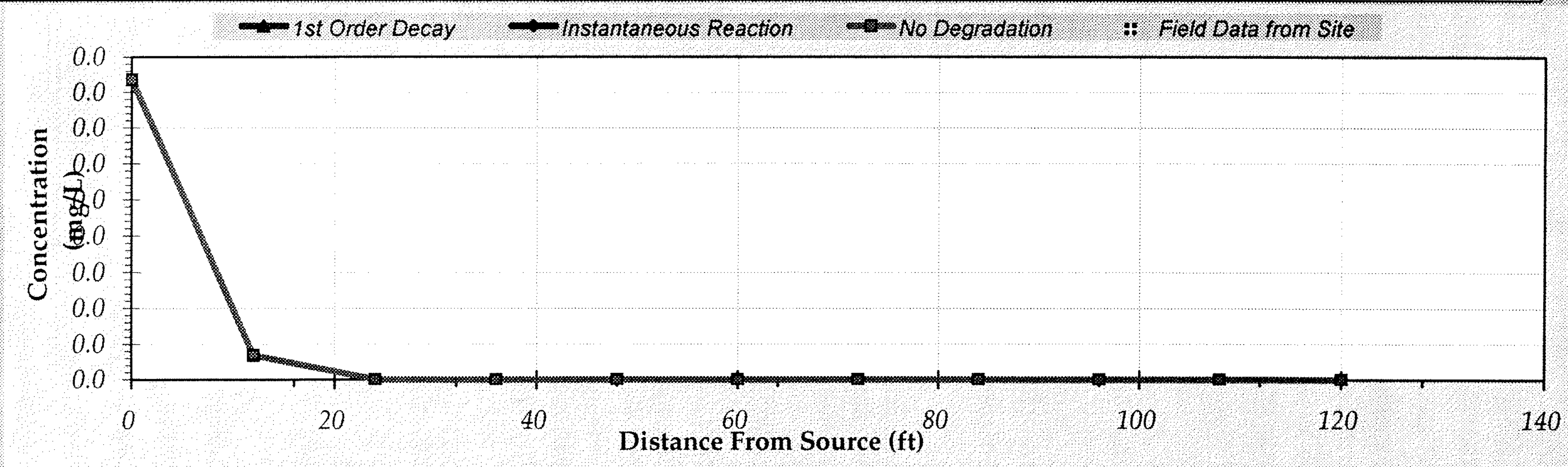
Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR NICKEL

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	12	24	36	48	60	72	84	96	108	120
No Degradation	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.017	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time:

300 Years

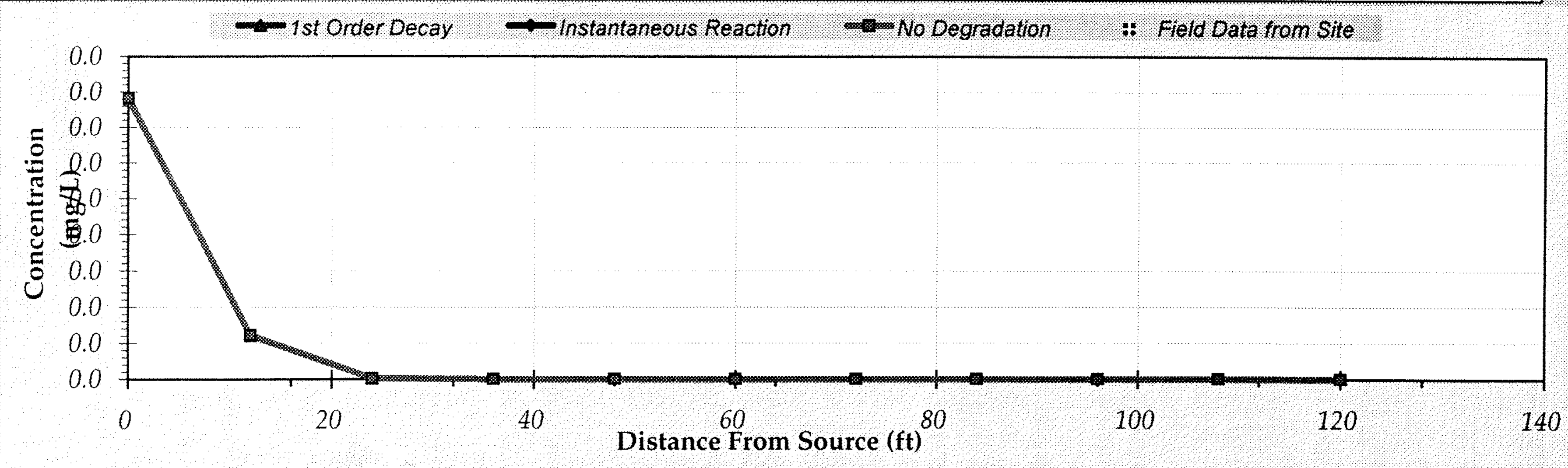
Return to Input

Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR NICKEL

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft) 0	12	24	36	48	60	72	84	96	108	120
No Degradation	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.016	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time:

400 Years

Return to Input

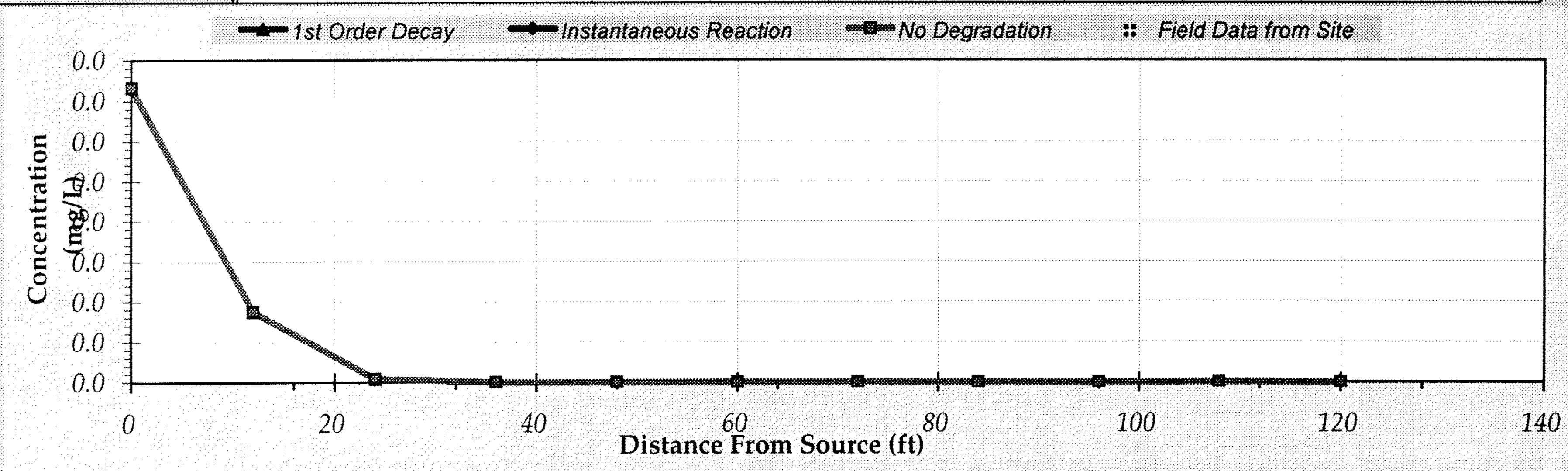
Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR NICKEL

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	12	24	36	48	60	72	84	96	108	120
No Degradation	0.015	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.015	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.015	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Replay Animation

Next Timestep

Prev Timestep

Time:

500 Years

Return to Input

Recalculate This Sheet

BIOSCREEN – NO DEGRADATION MODEL FOR NICKEL

(ATTACHEMNT 2)
ECOLOGICAL COPC – RFI, TABLE 5

Table 5-15
Comparison of Solid Waste Management Unit (SWMU) 12 Groundwater Ecological Chemical of Potential Concern (ECPC) Exposure Concentrations (In St. Johns River) with Toxicity Benchmarks

RCRA Facility Investigation, Group II SWMUs
U.S. Naval Station
Mayport, Florida

Analyte	St. Johns River Exposure Concentration: Maximum/Average Exposure Point Concentrations for Groundwater[1]	Florida Surface Water Quality Standard[2]	Federal AWQC[3]	AQUIRE[4] (Lowest reported adverse effect concentration)	Concentrations Detected in Surface Waters of St. Johns River[5]	Concentrations Detected in Background Surface Water Samples[6]	Results of Comparison
__Volatile Analytes__ (µg/ℓ)							
1,1-Dichloroethane	1 / 1	NA	NA	NA	ND	ND	Benchmark not available
1,2-Dichlorobenzene	2 / 1.5	NA	129[7]	9.7	ND	ND	Benchmark not exceeded
1,2-Dichloroethene	2 / 2	NA	NA	NA	ND	ND	Benchmark not available
__Semivolatile Analytes__ (µg/ℓ)							
4-Nitrophenol	13 / 12	NA	NA	27	ND	ND	Benchmark not exceeded
__Inorganic Analytes__ (µg/ℓ)							
Copper	19.7 / 13.6	2.9	2.9	NS	4.1 - 5	2.4 - 37.2	Exceedance of 6.8 times the lowest benchmark
Lead	5.7 / 3.4	5.6	8.5	NS	ND	0.91 - 1.5	Exceedance of 1.02 times the lowest benchmark
Nickel	20.4 / 20.4	8.3	8.3	NS	ND	13	Exceedance of 2.5 times the lowest benchmark

See notes at end of table.

(ATTACHEMNT 3)
DETERMINATION OF COCS USING RESIDENTIAL SCENARIO

SWMU 12

TABLE 2-6
SWMU 12 SURFACE SOIL INITIAL COPCs - RESIDENTIAL DIRECT CONTACT
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR[2]	INITIAL TARGET CRITERIA[3] (mg/kg)	EXCEEDS INITIAL TARGET CRITERIA[4]
Arsenic	7440-38-2	M	3/3	1.3	0.8	Carcinogen -Cardiovascular -Skin	4	0.2	Yes
Barium	7440-39-3	M	3/3	8	110	Cardiovascular	3	36.67	No
Beryllium	7440-41-7	M	3/3	0.08	120	Carcinogen -Gastrointestinal -Respiratory	4	30	No
Cadmium	7440-43-9	M	2/3	1.2	75	Carcinogen -Kidney	4	18.75	No
Chromium[5]	7440-47-3	M	3/3	3.4	210	Carcinogen -Respiratory	4	52.5	No
Cobalt	7440-48-4	M	1/3	0.65	4700	Cardiovascular -Immunological -Neurological-Reproductive	4	1,175	No
Copper	7440-50-8	M	3/3	3.8	110	None Specified	1	110	No
Cyanide	57-12-5	M	2/3	0.17	30	Body Weight -Neurological -Thyroid	4	7.5	No
Lead	7439-92-1	M	3/3	14	400	Neurological	4	100	No
Mercury	7439-97-6	M	1/3	0.05	3.4	Neurological	4	0.85	No
Nickel	7440-02-0	M	1/3	2.6	110	Body Weight	2	55	No
Vanadium	7440-62-2	M	3/3	10.3	15	None Specified	1	15	No
Zinc	7440-66-6	M	3/3	23.3	23000	Blood	1	23,000	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.
2 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ.
3 - The SCTL for direct contact with soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative affects.
4 - Comparison of the Initial Target Criteria with the Maximum Concentration.
5 - SCTL Residential screening values used for Chromium (Hexavalent)
M - Metals
OS - Semivolatiles
OV - Volatiles
PES - Pesticides
PET - Petroleum
Misc - Miscellaneous

TABLE 2-7
SWMU 12 SURFACE SOIL FINAL COPCs - RESIDENTIAL DIRECT CONTACT
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[2]			ADJUSTMENT DIVISOR[3]	COPC TARGET CRITERIA[4] (mg/kg)	COPC BASED ON RESIDENTIAL DIRECT CONTACT[5] (Yes/No)
						Carcinogen	Cardiovascular	Skin			
Arsenic	7440-38-2	M	1.3	0.8	Carcinogen -Cardiovascular -Skin	1.625	1.625	1.625	1	0.8	Yes
					Cumulative Sum	1.625	1.625	1.625			

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.
2 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
3 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ. If the Cumulative Sum is less than 1 then the Adjustment Divisor is equal to 1.
4 - The SCTL for direct contact with soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative affects.
5 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the COPC target criteria.

TABLE 2-8
SWMU 12 SURFACE SOIL COPCs - LEACHING
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	SCTL LEACHING TO GROUNDWATER[1] (mg/kg)	SCTL LEACHING TO SURFACEWATER[2] (mg/kg)	LEACHING TARGET CRITERIA[3] (mg/kg)	COPC BASED ON LEACHING[4] (Yes/No)
Arsenic	7440-38-2	M	3/3	1.3	29	NA	29	No
Barium	7440-39-3	M	3/3	8	1,600	NA	1,600	No
Beryllium	7440-41-7	M	3/3	0.08	63	NA	63	No
Cadmium	7440-43-9	M	2/3	1.2	8	NA	8	No
Chromium[5]	7440-47-3	M	3/3	3.4	38	NA	38	No
Cobalt	7440-48-4	M	1/3	0.65	No Criteria	NA	No Criteria	No
Copper	7440-50-8	M	3/3	3.8	No Criteria	NA	No Criteria	No
Cyanide	57-12-5	M	2/3	0.17	40	NA	40	No
Lead	7439-92-1	M	3/3	14	No Criteria	NA	No Criteria	No
Mercury	7439-97-6	M	1/3	0.05	2.1	NA	2.1	No
Nickel	7440-02-0	M	1/3	2.6	130	NA	130	No
Vanadium	7440-62-2	M	3/3	10.3	980	NA	980	No
Zinc	7440-66-6	M	3/3	23.3	6,000	NA	6,000	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Soil leaching to groundwater - Chapter 62-777 F.A.C., May 1999
2 - SCTL - Soil Cleanup Target Level for Soil leaching to surfacewater - Chapter 62-777 F.A.C., May 1999
3 - Minimum SCTL based to soil leaching to groundwater and soil leaching to surface water (if applicable) .
4 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the leaching target criteria.
5 - SCTL screening values used for Chromium (Hexavalent)
NA - Not Applicable

TABLE 2-9
SWMU 12 SURFACE SOIL COCs - RESIDENTIAL DIRECT CONTACT
NAVSTA MAYPORT, FLORIDA

COPCs	CAS NUMBER	FRACTION	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	REPRESENTATIVE CONCENTRATION[1] (mg/kg)	SCTL RESIDENTIAL[2] (mg/kg)	BACKGROUND CONCENTRATION[3] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[4]			ADJUSTMENT DIVISOR[5]	ADJUSTED MEDIA CLEANUP STANDARD DIRECT CONTACT[6] (mg/kg)	COC BASED ON RESIDENTIAL DIRECT CONTACT[7]
									Carcinogen	Cardiovascular	Skin			
Arsenic	7440-38-2	M	3/3	1.3	1.3	0.8	-	Carcinogen -Cardiovascular -Skin	1.625	1.625	1.625	1	0.8	Yes
								Cumulative Sum	1.625	1.625	1.625			

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.
3 - Mayport background concentration (Tetra Tech NUS, 2000).
4 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
5 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ. If the Cumulative Sum is less than 1 then the Adjustment Divisor is equal to 1.
6 - The Adjusted Media Cleanup Standard (MCS) Direct Contact is the Residential SCTL divided by Adjustment Divisor or the background concentration, whichever is greater.
7 - A COPC is selected as a COC if the representative concentration exceeds the Adjusted Media Cleanup Standard Direct Contact.

TABLE 2-10
SWMU 12 SURFACE SOIL COCs - RESIDENTIAL DIRECT CONTACT AND LEACHING (COMBINED)
NAVSTA MAYPORT, FLORIDA

COCs	CAS NUMBER	MAXIMUM CONCENTRATION (mg/kg)	REPRESENTATIVE CONCENTRATION[1] (mg/kg)	BACKGROUND CONCENTRATION[2] (mg/kg)	ADJUSTED MEDIA CLEANUP STANDARD DIRECT CONTACT[3] (mg/kg)	MEDIA CLEANUP STANDARD LEACHING[4] (mg/kg)	FINAL MEDIA CLEANUP STANDARD[5] (mg/kg)	MCS BASIS[6]
Arsenic	7440-38-2	1.3	1.3	-	0.8	-	0.8	Direct Contact

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - Mayport background concentration (Tetra Tech NUS, 2000).
3 - The Adjusted Media Cleanup Standard (MCS) Direct Contact is the Residential SCTL divided by the Adjustment Divisor or the background concentration, whichever is greater.
4 - The Media Cleanup Standard (MCS) Leaching is the Leaching to Groundwater SCTL or the background concentration, whichever is greater.
5 - Final MCS is the Minimum of the Adjusted MCS Direct Contact or MCS Leaching
6 - MCS Basis is either Background, Direct Contact or Leaching (Leaching to Groundwater or Leaching to Surfacewater (if applicable)).

SWMU 17

TABLE 2-6
SWMU 17 SURFACE SOIL INITIAL COPCs - RESIDENTIAL DIRECT CONTACT
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR[2]	INITIAL TARGET CRITERIA[3] (mg/kg)	EXCEEDS INITIAL TARGET CRITERIA[4]
2-Butanone	78-93-3	OV	2/15	0.011	3,100	Developmental	2	1,550	No
Carbon Disulfide	75-15-0	OV	3/15	0.003	200	Developmental -Neurological	10	20	No
Toluene	108-88-3	OV	4/15	0.004	380	Kidney -Liver -Neurological	10	38	No
Xylenes, Total	1330-20-7	OV	11/15	0.01	5,900	Body Weight -Mortality -Neurological	10	590	No
Benzo(a)anthracene	56-55-3	OS	2/15	0.17	1.4	Carcinogen	18	0.078	Yes
Benzo(a)pyrene	50-32-8	OS	3/15	0.27	0.1	Carcinogen	18	0.0056	Yes
Benzo(b)fluoranthene	205-99-2	OS	3/15	0.28	1.4	Carcinogen	18	0.078	Yes
Benzo(g,h,i)perylene	191-24-2	OS	3/15	0.36	2,300	Neurological	10	230	No
Benzo(k)fluoranthene	207-08-9	OS	3/15	0.37	15	Carcinogen	18	0.83	No
Bis(2-Ethylhexyl)phthalate	117-81-7	OS	3/15	0.14	76	Carcinogen -Liver	18	4.22	No
Chrysene	218-01-9	OS	3/15	0.29	140	Carcinogen	18	7.78	No
Di-n-butyl phthalate	84-74-2	OS	3/15	0.044	7,300	Mortality	3	2,433.33	No
Dibenzo(a,h)anthracene	53-70-3	OS	1/15	0.14	0.1	Carcinogen	18	0.006	Yes
Fluoranthene	206-44-0	OS	5/15	0.36	2,900	Blood -Kidney -Liver	8	362.5	No
Indeno(1,2,3-cd)pyrene	193-39-5	OS	3/15	0.28	1.5	Carcinogen	18	0.083	Yes
Naphthalene	91-20-3	OS	1/15	0.21	40	Body Weight -Nasal	5	8	No
Phenanthrene	85-01-8	OS	2/15	0.095	2,000	Kidney	6	333.33	No
Pyrene	129-00-0	OS	5/15	0.28	2,200	Kidney	6	366.67	No
4,4'-DDD	72-54-8	PES	3/15	0.012	4.6	Carcinogen	18	0.26	No
4,4'-DDE	72-55-9	PES	13/15	0.52	3.3	Carcinogen	18	0.18	Yes
4,4'-DDT	50-29-3	PES	11/15	0.22	3.3	Carcinogen -Liver	18	0.18	Yes
Aroclor-1260	11096-82-5	PES	1/15	0.031	0.5	Carcinogen -Immunological	18	0.028	Yes
Chlordane	57-74-9	PES	7/15	0.18	3.1	Carcinogen -Liver	18	0.17	Yes
Dieldrin	60-57-1	PES	1/15	0.011	0.07	Carcinogen -Liver	18	0.0039	Yes
Endrin	72-20-8	PES	1/15	0.0035	21	Liver	8	2.63	No
Aluminum	7429-90-5	M	10/10	2,900	72,000	Body Weight	5	14,400	No
Antimony	7440-36-0	M	8/15	2.5	26	Blood -Mortality	4	6.5	No
Arsenic	7440-38-2	M	14/15	1.8	0.8	Carcinogen -Cardiovascular -Skin	18	0.044	Yes
Barium	7440-39-3	M	15/15	25.4	110	Cardiovascular	3	36.67	No
Beryllium	7440-41-7	M	10/15	0.17	120	Carcinogen -Gastrointestinal -Respiratory	18	6.67	No
Cadmium	7440-43-9	M	4/15	1.2	75	Carcinogen -Kidney	18	4.17	No
Calcium	7440-70-2	M	10/10	273,000				Nutrient	No
Chromium[5]	7440-47-3	M	15/15	20.2	210	Carcinogen -Respiratory	18	11.67	Yes
Cobalt	7440-48-4	M	6/15	1.6	4,700	Cardiovascular -Immunological -Neurological-Reproductive	10	470	No
Copper	7440-50-8	M	12/15	18.4	110	None Specified	1	110	No
Cyanide	57-12-5	M	3/15	0.25	30	Body Weight -Neurological -Thyroid	10	3	No
Iron	7439-89-6	M	10/10	3,320	23,000	Blood -Gastrointestinal	4	5,750	No
Lead	7439-92-1	M	15/15	252	400	Neurological	10	40	Yes
Magnesium	7439-95-4	M	10/10	1,850				Nutrient	No
Manganese	7439-96-5	M	10/10	78.6	1,600	Neurological	10	160	No
Mercury	7439-97-6	M	7/15	0.14	3.4	Neurological	10	0.34	No
Nickel	7440-02-0	M	1/15	10.4	110	Body Weight	5	22	No
Selenium	7782-49-2	M	4/15	0.44	390	Hair Loss -Neurological -Skin	10	39	No
Sodium	7440-23-5	M	10/10	715				Nutrient	No

TABLE 2-6
SWMU 17 SURFACE SOIL INITIAL COPCs - RESIDENTIAL DIRECT CONTACT
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR[2]	INITIAL TARGET CRITERIA[3] (mg/kg)	EXCEEDS INITIAL TARGET CRITERIA[4]
Tin	7440-31-5	M	9/15	69	44,000	Kidney -Liver	8	5,500	No
Vanadium	7440-62-2	M	15/15	13.5	15	None Specified	1	15	No
Zinc	7440-66-6	M	15/15	91.2	23,000	Blood	4	5,750	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.
2 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ.
3 - The SCTL for direct contact with soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative affects.
4 - Comparison of the Initial Target Criteria with the Maximum Concentration.
5 - SCTL Residential screening values used for Chromium (Hexavalent)
M - Metals
OS - Semivolatiles
OV - Volatiles
PES - Pesticides
PET - Petroleum
Misc - Miscellaneous

TABLE 2-7
SWMU 17 SURFACE SOIL FINAL COPCs - RESIDENTIAL DIRECT CONTACT
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[2]							ADJUSTMENT DIVISOR[3]	COPC TARGET CRITERIA[4] (mg/kg)	COPC BASED ON RESIDENTIAL DIRECT CONTACT[5] (Yes/No)
						Carcinogen	Cardiovascular	Skin	Respiratory	Neurological	Liver	Immunological			
Benzo(a)anthracene	56-55-3	OS	0.17	1.4	Carcinogen	0.121							12	0.117	Yes
Benzo(a)pyrene	50-32-8	OS	0.27	0.1	Carcinogen	2.7							12	0.0083	Yes
Benzo(b)fluoranthene	205-99-2	OS	0.28	1.4	Carcinogen	0.2							12	0.117	Yes
Dibenzo(a,h)anthracene	53-70-3	OS	0.14	0.1	Carcinogen	1.4							12	0.008	Yes
Indeno(1,2,3-cd)pyrene	193-39-5	OS	0.28	1.5	Carcinogen	0.187							12	0.125	Yes
4,4'-DDE	72-55-9	PES	0.52	3.3	Carcinogen	0.158							12	0.28	Yes
4,4'-DDT	50-29-3	PES	0.22	3.3	Carcinogen -Liver	0.067					0.067		12	0.28	No
Aroclor-1260	11096-82-5	PES	0.031	0.5	Carcinogen -Immunological	0.062						0.062	12	0.042	No
Chlordane	57-74-9	PES	0.18	3.1	Carcinogen -Liver	0.058					0.058		12	0.26	No
Dieldrin	60-57-1	PES	0.011	0.07	Carcinogen -Liver	0.157					0.157		12	0.0058	Yes
Arsenic	7440-38-2	M	1.8	0.8	Carcinogen -Cardiovascular -Skin	2.25	2.25	2.25					12	0.067	Yes
Chromium[4]	7440-47-3	M	20.2	210	Carcinogen -Respiratory	0.096			0.096				12	17.50	Yes
Lead	7439-92-1	M	252	400	Neurological					0.63			1	400	No
					Cumulative Sum	7.456	2.25	2.25	0.096	0.63	0.282	0.062			

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.
2 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
3 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ. If the Cumulative Sum is less than 1 then the Adjustment Divisor is equal to 1.
4 - The SCTL for direct contact with soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative affects.
5 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the COPC target criteria.

TABLE 2-8
SWMU 17 SURFACE SOIL COPCs - LEACHING
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	SCTL LEACHING TO GROUNDWATER[1] (mg/kg)	SCTL LEACHING TO SURFACEWATER[2] (mg/kg)	LEACHING TARGET CRITERIA[3] (mg/kg)	COPC BASED ON LEACHING[4] (Yes/No)
2-Butanone	78-93-3	OV	2/15	0.011	17	NA	17	No
Carbon Disulfide	75-15-0	OV	3/15	0.003	5.6	NA	5.6	No
Toluene	108-88-3	OV	4/15	0.004	0.5	NA	0.5	No
Xylenes, Total	1330-20-7	OV	11/15	0.01	0.2	NA	0.2	No
Benzo(a)anthracene	56-55-3	OS	2/15	0.17	3.2	NA	3.2	No
Benzo(a)pyrene	50-32-8	OS	3/15	0.27	8	NA	8	No
Benzo(b)fluoranthene	205-99-2	OS	3/15	0.28	10	NA	10	No
Benzo(g,h,i)perylene	191-24-2	OS	3/15	0.36	32,000	NA	32,000	No
Benzo(k)fluoranthene	207-08-9	OS	3/15	0.37	25	NA	25	No
Bis(2-Ethylhexyl)phthalate	117-81-7	OS	3/15	0.14	3,600	NA	3,600	No
Chrysene	218-01-9	OS	3/15	0.29	77	NA	77	No
Di-n-butyl phthalate	84-74-2	OS	3/15	0.044	47	NA	47	No
Dibenzo(a,h)anthracene	53-70-3	OS	1/15	0.14	30	NA	30	No
Fluoranthene	206-44-0	OS	5/15	0.36	1,200	NA	1,200	No
Indeno(1,2,3-cd)pyrene	193-39-5	OS	3/15	0.28	28	NA	28	No
Naphthalene	91-20-3	OS	1/15	0.21	1.7	NA	1.7	No
Phenanthrene	85-01-8	OS	2/15	0.095	250	NA	250	No
Pyrene	129-00-0	OS	5/15	0.28	880	NA	880	No
4,4'-DDD	72-54-8	PES	3/15	0.012	4	NA	4	No
4,4'-DDE	72-55-9	PES	13/15	0.52	18	NA	18	No
4,4'-DDT	50-29-3	PES	11/15	0.22	11	NA	11	No
Aroclor-1260	11096-82-5	PES	1/15	0.031	17	NA	17	No
Chlordane	57-74-9	PES	7/15	0.18	9.6	NA	9.6	No
Dieldrin	60-57-1	PES	1/15	0.011	0.004	NA	0.004	Yes
Endrin	72-20-8	PES	1/15	0.0035	1	NA	1	No
Aluminum	7429-90-5	M	10/10	2,900	No Criteria	NA	No Criteria	No
Antimony	7440-36-0	M	8/15	2.5	5	NA	5	No
Arsenic	7440-38-2	M	14/15	1.8	29	NA	29	No
Barium	7440-39-3	M	15/15	25.4	1,600	NA	1,600	No
Beryllium	7440-41-7	M	10/15	0.17	63	NA	63	No
Cadmium	7440-43-9	M	4/15	1.2	8	NA	8	No
Calcium	7440-70-2	M	10/10	273,000	No Criteria	NA	No Criteria	No
Chromium[4]	7440-47-3	M	15/15	20.2	38	NA	38	No

TABLE 2-8
SWMU 17 SURFACE SOIL COPCs - LEACHING
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	SCTL LEACHING TO GROUNDWATER[1] (mg/kg)	SCTL LEACHING TO SURFACEWATER[2] (mg/kg)	LEACHING TARGET CRITERIA[3] (mg/kg)	COPC BASED ON LEACHING[4] (Yes/No)
Cobalt	7440-48-4	M	6/15	1.6	No Criteria	NA	No Criteria	No
Copper	7440-50-8	M	12/15	18.4	No Criteria	NA	No Criteria	No
Cyanide	57-12-5	M	3/15	0.25	40	NA	40	No
Iron	7439-89-6	M	10/10	3,320	No Criteria	NA	No Criteria	No
Lead	7439-92-1	M	15/15	252	No Criteria	NA	No Criteria	No
Magnesium	7439-95-4	M	10/10	1,850	No Criteria	NA	No Criteria	No
Manganese	7439-96-5	M	10/10	78.6	No Criteria	NA	No Criteria	No
Mercury	7439-97-6	M	7/15	0.14	2.1	NA	2.1	No
Nickel	7440-02-0	M	1/15	10.4	130	NA	130	No
Selenium	7782-49-2	M	4/15	0.44	5	NA	5	No
Sodium	7440-23-5	M	10/10	715	No Criteria	NA	No Criteria	No
Tin	7440-31-5	M	9/15	69	No Criteria	NA	No Criteria	No
Vanadium	7440-62-2	M	15/15	13.5	980	NA	980	No
Zinc	7440-66-6	M	15/15	91.2	6,000	NA	6,000	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Soil leaching to groundwater - Chapter 62-777 F.A.C., May 1999
2 - SCTL - Soil Cleanup Target Level for Soil leaching to surfacewater - Chapter 62-777 F.A.C., May 1999
3 - Minimum SCTL based to soil leaching to groundwater and soil leaching to surface water (if applicable) .
4 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the leaching target criteria.
5 - SCTL screening values used for Chromium (Hexavalent)
NA - Not Applicable

TABLE 2-9
SWMU 17 SURFACE SOIL COCs - RESIDENTIAL DIRECT CONTACT
NAVSTA MAYPORT, FLORIDA

COPCs	CAS NUMBER	FRACTION	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	REPRESENTATIVE CONCENTRATION[1] (mg/kg)	SCTL RESIDENTIAL[2] (mg/kg)	BACKGROUND CONCENTRATION[3] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[4]					ADJUSTMENT DIVISOR[5]	ADJUSTED MEDIA CLEANUP STANDARD DIRECT CONTACT[6] (mg/kg)	COC BASED ON RESIDENTIAL DIRECT CONTACT[7]
									Carcinogen	Cardiovascular	Skin	Respiratory	Liver			
Benzo(a)anthracene	56-55-3	OS	2/15	0.17	0.17	1.4	-	Carcinogen	0.121					9	0.156	Yes
Benzo(a)pyrene	50-32-8	OS	3/15	0.27	0.27	0.1	-	Carcinogen	2.7					9	0.011	Yes
Benzo(b)fluoranthene	205-99-2	OS	3/15	0.28	0.28	1.4	-	Carcinogen	0.2					9	0.156	Yes
Dibenzo(a,h)anthracene	53-70-3	OS	1/15	0.14	0.14	0.1	-	Carcinogen	1.4					9	0.011	Yes
Indeno(1,2,3-cd)pyrene	193-39-5	OS	3/15	0.28	0.28	1.5	-	Carcinogen	0.187					9	0.167	Yes
4,4'-DDE	72-55-9	PES	13/15	0.52	0.52	3.3	-	Carcinogen	0.158					9	0.37	Yes
Dieldrin	60-57-1	PES	1/15	0.011	0.011	0.07	-	Carcinogen -Liver	0.157				0.157	9	0.0078	Yes
Arsenic	7440-38-2	M	14/15	1.8	1.8	0.8	-	Carcinogen -Cardiovascular -Skin	2.25	2.25	2.25			9	0.089	Yes
Chromium[4]	7440-47-3	M	15/15	20.2	20.2	210	-	Carcinogen -Respiratory	0.096			0.096		9	23.33	No
								Cumulative Sum	7.269	2.25	2.25	0.096	0.157			

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.
3 - Mayport background concentration (Tetra Tech NUS, 2000).
4 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
5 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ. If the Cumulative Sum is less than 1 then the Adjustment Divisor is equal to 1.
6 - The Adjusted Media Cleanup Standard (MCS) Direct Contact is the Residential SCTL divided by Adjustment Divisor or the background concentration, whichever is greater.
7 - A COPC is selected as a COC if the representative concentration exceeds the Adjusted Media Cleanup Standard Direct Contact.

TABLE 2-10
SWMU 17 SURFACE SOIL COCs - LEACHING
NAVSTA MAYPORT, FLORIDA

COPCs	CAS NUMBER	FRACTION	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	REPRESENTATIVE CONCENTRATION[1] (mg/kg)	SCTL LEACHING TO GROUNDWATER[2] (mg/kg)	SCTL LEACHING TO SURFACEWATER[3] (mg/kg)	BACKGROUND CONCENTRATION[4] (mg/kg)	MEDIA CLEANUP STANDARD - LEACHING[5] (mg/kg)	COC BASED ON LEACHING[6]
Dieldrin	60-57-1	PES	1/15	0.011	0.011	0.004	NA	-	0.004	Yes

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - SCTL - Soil Cleanup Target Level for Leaching to Groundwater - Chapter 62-777 F.A.C., May 1999
3 - SCTL - Soil Cleanup Target Level for Soil leaching to surfacewater - Chapter 62-777 F.A.C., May 1999
4 - Mayport background concentration (Tetra Tech NUS, 2000).
5 - The Media Cleanup Standard (MCS) Leaching is the Leaching to Groundwater SCTL or the background concentration, whichever is greater.
6 - A COPC is selected as a COC if the representative concentration exceeds the Media Cleanup Standard - Leaching.
NA - Not Applicable

TABLE 2-11
SWMU 17 SURFACE SOIL COCs - RESIDENTIAL DIRECT CONTACT AND LEACHING (COMBINED)
NAVSTA MAYPORT, FLORIDA

COCs	CAS NUMBER	MAXIMUM CONCENTRATION (mg/kg)	REPRESENTATIVE CONCENTRATION[1] (mg/kg)	BACKGROUND CONCENTRATION[2] (mg/kg)	ADJUSTED MEDIA CLEANUP STANDARD DIRECT CONTACT[3] (mg/kg)	MEDIA CLEANUP STANDARD LEACHING[4] (mg/kg)	FINAL MEDIA CLEANUP STANDARD[5] (mg/kg)	MCS BASIS[6]
Benzo(a)anthracene	56-55-3	0.17	0.17	-	0.156	-	0.156	Direct Contact
Benzo(a)pyrene	50-32-8	0.27	0.27	-	0.011	-	0.011	Direct Contact
Benzo(b)fluoranthene	205-99-2	0.28	0.28	-	0.156	-	0.156	Direct Contact
Dibenzo(a,h)anthracene	53-70-3	0.14	0.14	-	0.011	-	0.011	Direct Contact
Indeno(1,2,3-cd)pyrene	193-39-5	0.28	0.28	-	0.167	-	0.167	Direct Contact
4,4'-DDE	72-55-9	0.52	0.52	-	0.37	-	0.37	Direct Contact
Dieldrin	60-57-1	0.011	0.011	-	0.0078	0.004	0.004	Leaching
Arsenic	7440-38-2	1.8	1.8	-	0.089	-	0.089	Direct Contact

Notes:
1 - The representative concentration is the 95% UCL (where appropriate) or the maximum detected concentration, whichever is less.
2 - Mayport background concentration (Tetra Tech NUS, 2000).
3 - The Adjusted Media Cleanup Standard (MCS) Direct Contact is the Residential SCTL divided by the Adjustment Divisor or the background concentration, whichever is greater.
4 - The Media Cleanup Standard (MCS) Leaching is the Leaching to Groundwater SCTL or the background concentration, whichever is greater.
5 - Final MCS is the Minimum of the Adjusted MCS Direct Contact or MCS Leaching
6 - MCS Basis is either Background, Direct Contact or Leaching (Leaching to Groundwater or Leaching to Surfacewater (if applicable)).

TABLE 2-6
SWMU 17 SUBSURFACE SOIL INITIAL COPCs - RESIDENTIAL DIRECT CONTACT
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	ADJUSTMENT DIVISOR[2]	INITIAL TARGET CRITERIA[3] (mg/kg)	EXCEEDS INITIAL TARGET CRITERIA[4]
2-Butanone	78-93-3	OV	1/3	0.006	3,100	Developmental	2	1,550	No
Carbon Disulfide	75-15-0	OV	1/3	0.003	200	Developmental -Neurological	6	33.33	No
Toluene	108-88-3	OV	1/3	0.002	380	Kidney -Liver -Neurological	6	63.33	No
Xylenes, Total	1330-20-7	OV	3/3	0.003	5,900	Body Weight -Mortality -Neurological	6	983.33	No
2-Methylnaphthalene	91-57-6	OV	1/3	0.17	83	Body Weight -Nasal	3	27.67	No
4,4'-DDD	72-54-8	PES	2/3	0.065	4.6	Carcinogen	6	0.77	No
4,4'-DDE	72-55-9	PES	2/3	0.18	3.3	Carcinogen	6	0.55	No
4,4'-DDT	50-29-3	PES	1/3	0.0041	3.3	Carcinogen -Liver	6	0.55	No
Endrin	72-20-8	PES	1/3	0.2	21	Liver	4	5.25	No
Arsenic	7440-38-2	M	3/3	0.38	0.8	Carcinogen -Cardiovascular -Skin	6	0.13	Yes
Barium	7440-39-3	M	3/3	4.2	110	Cardiovascular	2	55	No
Beryllium	7440-41-7	M	1/3	0.09	120	Carcinogen -Gastrointestinal -Respiratory	6	20	No
Chromium[5]	7440-47-3	M	1/3	4.1	210	Carcinogen -Respiratory	6	35	No
Cyanide	57-12-5	M	3/3	1.8	30	Body Weight -Neurological -Thyroid	6	5	No
Lead	7439-92-1	M	3/3	6.6	400	Neurological	6	66.67	No
Mercury	7439-97-6	M	1/3	0.03	3.4	Neurological	6	0.57	No
Tin	7440-31-5	M	2/3	5.3	44,000	Kidney -Liver	4	11,000	No
Vanadium	7440-62-2	M	3/3	4.4	15	None Specified	1	15	No
Zinc	7440-66-6	M	3/3	9.5	23,000	Blood	1	23,000	No
Total Organic Carbon	7440-44-0	MISC	1/1	691	No Criteria			No Criteria	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.
2 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ.
3 - The SCTL for direct contact with soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative affects.
4 - Comparison of the Initial Target Criteria with the Maximum Concentration.
5 - SCTL Residential screening values used for Chromium (Hexavalent)
M - Metals
OS - Semivolatiles
OV - Volatiles
PES - Pesticides
PET - Petroleum
Misc - Miscellaneous

TABLE 2-7
SWMU 17 SUBSURFACE SOIL FINAL COPCs - RESIDENTIAL DIRECT CONTACT
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	MAXIMUM CONCENTRATION (mg/kg)	SCTL RESIDENTIAL[1] (mg/kg)	TARGET ORGAN/SYSTEM OR EFFECT	Cumulative Cancer or Target Organ/System Analysis[2]			ADJUSTMENT DIVISOR[3]	COPC TARGET CRITERIA[4] (mg/kg)	COPC BASED ON RESIDENTIAL DIRECT CONTACT[5] (Yes/No)
						Carcinogen	Cardiovascular	Skin			
Arsenic	7440-38-2	M	0.38	0.8	Carcinogen -Cardiovascular -Skin	0.475	0.475	0.475	1	0.8	No
					Cumulative Sum	0.475	0.475	0.475			

Notes:
1 - SCTL - Soil Cleanup Target Level for Residential - Chapter 62-777 F.A.C., May 1999.
2 - The ratio of the maximum detected concentration to the SCTL is shown for each COPC; a ratio or sum of ratios greater than 1 for carcinogens or for any organ/system indicates an exceedance of FDEP guidance.
3 - Adjusted Divisor is determined by the number of carcinogens or chemicals that effect the same target organ. If the Cumulative Sum is less than 1 then the Adjustment Divisor is equal to 1.
4 - The SCTL for direct contact with soil in a residential setting from Chapter 62-777 F.A.C., Table 2, was divided by the adjustment divisor to account for cumulative affects.
5 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the COPC target criteria.

TABLE 2-8
SWMU 17 SUBSURFACE SOIL COPCs - LEACHING
NAVSTA MAYPORT, FLORIDA

CHEMICAL OF INTEREST	CAS NUMBER	FRACTION	FREQUENCY	MAXIMUM CONCENTRATION (mg/kg)	SCTL LEACHING TO GROUNDWATER [1] (mg/kg)	SCTL LEACHING TO SURFACEWATER [2] (mg/kg)	LEACHING TARGET CRITERIA [3] (mg/kg)	COPC BASED ON LEACHING[4] (Yes/No)
2-Butanone	78-93-3	OV	1/3	0.006	17	NA	17	No
Carbon Disulfide	75-15-0	OV	1/3	0.003	5.6	NA	5.6	No
Toluene	108-88-3	OV	1/3	0.002	0.5	NA	0.5	No
Xylenes, Total	1330-20-7	OV	3/3	0.003	0.2	NA	0.2	No
2-Methylnaphthalene	91-57-6	OV	1/3	0.17	6.1	NA	6.1	No
4,4'-DDD	72-54-8	PES	2/3	0.065	4	NA	4	No
4,4'-DDE	72-55-9	PES	2/3	0.18	18	NA	18	No
4,4'-DDT	50-29-3	PES	1/3	0.0041	11	NA	11	No
Endrin	72-20-8	PES	1/3	0.2	1	NA	1	No
Arsenic	7440-38-2	M	3/3	0.38	29	NA	29	No
Barium	7440-39-3	M	3/3	4.2	1,600	NA	1,600	No
Beryllium	7440-41-7	M	1/3	0.09	63	NA	63	No
Chromium[5]	7440-47-3	M	1/3	4.1	38	NA	38	No
Cyanide	57-12-5	M	3/3	1.8	40	NA	40	No
Lead	7439-92-1	M	3/3	6.6	No Criteria	NA	No Criteria	No
Mercury	7439-97-6	M	1/3	0.03	2.1	NA	2.1	No
Tin	7440-31-5	M	2/3	5.3	No Criteria	NA	No Criteria	No
Vanadium	7440-62-2	M	3/3	4.4	980	NA	980	No
Zinc	7440-66-6	M	3/3	9.5	6,000	NA	6,000	No
Total Organic Carbon	7440-44-0	MISC	1/1	691	No Criteria	NA	No Criteria	No

Notes:
1 - SCTL - Soil Cleanup Target Level for Soil leaching to groundwater - Chapter 62-777 F.A.C., May 1999
2 - SCTL - Soil Cleanup Target Level for Soil leaching to surfacewater - Chapter 62-777 F.A.C., May 1999
3 - Minimum SCTL based to soil leaching to groundwater and soil leaching to surface water (if applicable) .
4 - A COI is selected as a COPC if the maximum concentration of that chemical exceeds the leaching target criteria.
5 - SCTL screening values used for Chromium (Hexavalent)
NA - Not Applicable

(ATTACHEMNT 4)
CONCENTRATION COMPARISON OF AUGUST 2001 SAMPLING EVENT
WITH RFI
SWMU 12

Table 1
SWMU NO 12, Concentration Comparison of August 2001 Sampling Event with RFI
NAVSTA Mayport - Mayport, FL

Monitoring Well ID	COC from CMS	CMS Concentration	MCS	08/15/01 Sampling Event Concentration
MPT-11-MW01S	pH	7.5	6.5-8.5	5.96-8.10
	Copper	7.4	3.0	<10
MPT-11-MW02S	pH	11.4	6.5-8.5	5.71-9.29
	Copper	19.7	3.0	16.4
	Nickel	20.4	8.3	6.63
	Vanadium	110	49	62
	Phenol	43	6.5	<50/152[1]
MPT-11-MW03S	pH	7.2	6.5-8.5	7.78-8.86
	Iron	915	494	756

Notes:
All concentrations reported in micrograms per liter (ug/L).
1 - A Phenol concentration of 152 ug/L was reported in the duplicate sample at this location. However, a concentration of 64 ug/L was reported in the equipment blank.